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CLINICAL OBSERVATIONS ON THE LOCAL USE OF SULFANILAMIDE IN DENTISTRY

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The importance of sulfanilamide is perhaps best expressed in the preface of Long and Bliss's recent monograph[1], in which they state: "Six years have passed since Foerster reported upon the use of prontosil in the treatment of a child ill with staphylococcal sepsis. In the intervening period we have witnessed the conquering of streptococcal, meningococcal, gonococcal, pneumococcal, and many other types of infections by means of chemotherapy, and we have seen the development of clinical application of numbers of new sulfonamide-containing drugs. While the period has been brief it has been called 'epochal in the history of medicine'."

Although dentistry has participated in the benefits derived from this miraculous drug, the complete field of its usefulness has not been explored. Since our preliminary reports[2] [3] in 1937, we have used sulfanilamide or one of its derivatives in cellulitis, acute osteomyelitis and in infected compound fractures with amazing results.

Acute necrotic gingivitis (Vincent's infection), which is a mixed infection, does not respond to sulfanilamide in a satisfactory manner. The spirochete is perhaps the organism of importance in this symbiotic group[4]. The orthodox treatment is so dependable that any deviation in the treatment of this potentially dangerous infection might result in disaster.

In the treatment of cellulitis, acute osteomyelitis or infected compound fractures where the drug can be placed into the infected area, response is usually dramatic. The value of sulfanilamide in chronic osteomyelitis is questionable.

During the past three years, our clinical observations of the local use of sulfanilamide or its related compound, sulfapyridine, following all extractions and operations justifies our continued use of this drug. No local toxic effect has been noted in a single case. There is a lag in the filling of the socket with granulation tissue in some instances. However, this is only temporary, as the cortical closure of the socket seems to be complete within the normal time. X-rays of sockets thus treated show a normal filling-in of bone substance. No swelling or temperature has been noted following the extraction of teeth, nor has any abnormal healing been observed during this therapy.

Sulfanilamide will not prevent autolysis of the blood clot ("dry socket") when excessive trauma has been produced during an extraction. Circulatory damage influences the growth of granulation tissue into the blood clot, and the clot dissolves before granulation tissue is established, resulting in the so-called "dry socket". Excessive trauma is usually produced while removing teeth with roots embedded in a sclerosed

Read before the Section on the General Practice of Medicine and Surgery, Medical Society of the State of North Carolina, Pinehurst, May 15, 1940.

1. Long, P. H. and Bliss, E. A.: Clinical Use of Sulfanilamide and Sulfapyridine and Allied Compounds, New York, Macmillan Company, 1939.
2. Sinclair, J. A.: Preliminary Report on the Local Use of Sulfanilamide in the Treatment of Oral Lesions, J. Canadian Den. Asso. 3:571, November, 1937.
3. Sinclair, J. A. and Barker, O. C.: Preliminary Report on Local Use of Sulfanilamide in Treatment of Oral Lesions. Am. J. Orthodontia and Oral Surg. 24:266, March, 1938.
4. Smith, D. T.: Preface to Fuso-Spirochetal Disease, Baltimore, Williams & Wilkins Company, 1932.

area of bone. Interosseous circulation, which influences the growth of granulation tissue, is scant in this area, if present at all[5]. Sulfanilamide is unable to prevent the "dry socket" when this condition is encountered, but it does prevent pain, and hastens healing by controlling infection. In these conditions, extractions produce a lesion similar to a compound fracture after it has been reduced.

So far, we have not observed any drug incompatible with sulfanilamide when both are used locally. We have employed dentalone, anesthesin, iodine and subsulphate of iron (Monsel's solution) in conjunction with sulfanilamide without any noticeable tissue damage. However, we received one report from Dr. Conrad L. Inman, of Baltimore, who said that he saw a case in which sulfanilamide in combination with iodoform gauze saturated with dentalone was used in an infected third molar socket, and that there was a very sudden and extensive amount of swelling in the floor of the mouth, followed by a great amount of sloughing. This is the only report of tissue damage that we have received, and it is our opinion that the patient was sensitive to iodoform.

Dr. Inman also reported: "At the same time as the above case, there was another using the same combination of drugs in a similarly infected socket with no apparent deleterious effect."

I also received a case report from Dr. Raymond A. Gates of Eddystone, Pennsylvania, where iodoform gauze saturated with dentalone and sulfanilamide was used and brought relief of pain to a patient within a few hours and complete recovery following four treatments. This patient had required morphine for four days and nights prior to the use of sulfanilamide.

In 1937, we reported our first case in which sulfanilamide was used locally in the treatment of an infected compound fracture and acute osteomyelitis. Since then, we have treated many similar infections with satisfactory results.

Perhaps the greatest clinical evidence of the value of sulfanilamide in dentistry is shown in the experiences of Dr. William Lanier, in charge of the dental clinic at the United States Veterans' Hospital in Oteen, North Carolina. Sulfanilamide was used following extraction of 6,800 teeth for hospitalized patients who were suffering from some form of chronic infection. The great majority of them were tuberculosis patients, who are known to have a low resistance to infection. In a personal communication, Dr. Lanier stated that all lesions healed without complications or pain. Sulfanilamide is used routinely following all extractions, fractures, and osteomyelitis cases in the hospital.

In placing sulfanilamide into the socket of a recently extracted tooth, the condition is neither a true 'in vivo' nor a true 'in vitro', but it is nearer the 'in vitro' state. There is no circulation within the area until the growth of granulation tissue begins, although there is a migration of leukocytes and serum seepage into the area. The placing of a small portion of a tablet into the socket enables it to take up its maximum concentration of sulfanilamide. This maximum saturation of the socket content is maintained by the excess chemical. This is also true of a compound fracture or of osteomyelitis.

We have measured the capacity of many molar sockets and have found the average to be one-half of a cubic centimeter. To bring the concentration of the contents of the socket up to the required 10 mg. per 100 cc. of blood would require only 1/20 mg., or 1/1300 gr. of sulfanilamide. A grain would be 1,300 times the required concentration to inhibit growth, if all the chemical were absorbed at once.

We have used much more than one grain in the socket, and have found no adverse tissue reaction whatsoever. A large portion of a tablet is not advised because it takes up clot space, and as the main function of the clot is to furnish a frame work for the growth of granulation tissue, this might delay the normal filling-in of the socket.

In the beginning, we used a portion of a 5 gr. sulfanilamide tablet placed in the bottom of the socket. We also used pure sulfonamide granules, but our results were not as consistent as with the tablets. The constant oozing of blood might have taken the chemical out of the socket before completion of the initial growth period. "It is striking", Fox[6] writes, "that during the first four or five hours of growth, the sulphanilamide culture grows equally with the control. In other words, although the drug is in solu-

5. Sinclair, J. A. and Barker, O. C.: Healing of Bone Following Injury, Internat. J. Orthodontia & Oral Surgery, 23:300, March, 1937.

6. Fox, Charles L.: The Significance of the Oxidation of Sulphanilamide During Therapy, Am. J. M. Sc. 199:488, April, 1940.

tion and is readily diffusible, no bacteriostasis occurs until the bacteria are in the logarithmic phase of rapid growth." Of interest also is the well established fact, as expressed by Fox, that "when the relatively low inoculum limit of 100,000 organisms per cc. is exceeded no bacteriostasis can be detected, even with a large excess of sulphanilamide."

Because of its proven wider bacterial influence, we have tried sulfapyridine. Its superiority over sulfanilamide has not been noted, and we have discontinued its use.

The topical use of sulfanilamide has been extensively employed in the medical and dental practice of the Veterans' Administration. Drs. A. M. Wigglesworth and Herman Renkoff[7], of Oteen, have used powdered sulfanilamide as a local application in suppurative otitis media, tuberculous and non-tuberculous. These authors report 19 cases. In the 7 tuberculous cases, treatment ranged from one to two and a half months; four patients have no discharge and three are markedly improved. In the other cases treatment that continued for from one to two and a half months resulted in clearing up the discharge of ten patients, and marked improvement of two.

Drs. Frank W. Schwartz and Isadore Spark of Camp Custer, Michigan[8], have used sulfanilamide locally with success in furuncles, carbuncles, abscesses, trophic ulcers, necrotic lesions, chronic sinusitis, gaping infected wounds, and bed sores.

Jensen, Johnsrud, and Nelson, of the University of Minneapolis Medical[9] School, reported a series of compound fractures which were treated by the local implantation of from 5 to 15 Gm. of sulfanilamide crystals in the wound. In 39 compound fractures and 2 compound dislocations not a single primary infection occurred. Ninety-four open fractures treated by similar methods, but without sulfanilamide, showed a 27 per cent infection rate; there were seven cases of gas gangrene and five amputations were necessary to control infection.

The experiments of Bricker and Graham[10] show that sulfanilamide has an inhibitory effect on wound healing. Their experiment was suggested by the idea that the drug might be used prophylactically before certain operations in which the chance of wound infection might be great. It was desired to determine whether or not this drug had any inhibitory effect on wound healing, especially since antiseptics as a group do have such an effect.

Their experiments revealed that "fibroblastic growth is inhibited and does not reach its maximum velocity until after the fifth day. By the seventh day, however, the wounds of dogs treated with sulfanilamide were but slightly below those of untreated dogs in tensile strength. From the curves obtained one would judge that, had the experiment been carried further, a point would have been reached at which the wounds would have been of equal strength."

Neither Key[11] nor Jensen[9] found from their experiments any inhibitory effect following the local application of sulfanilamide.

From their clinical and experimental observations, Jensen, et al, present the interesting deduction: "Sulfanilamide crystals buried in a wound should dissolve slowly, the drug finding its way into general circulation over a period of many hours. During this time theoretically the serum, hematoma, and local tissues of the wound are saturated with sulfanilamide at 0.8 per cent concentration, the solubility of this compound at body temperature. These considerations suggest that by placing sufficient crystalline drug in the area of contamination a concentration approaching 800 mg. per cent should be maintained for a considerable length of time. In comparison, systemic medication with sulfanilamide attempts to attain only 10 to 20 mg. per cent in the blood. Hence, by local introduction of the drug with subsequent closure of the wound, a concentration eighty times that obtained by systemic medication apparently is assured for a prolonged period in the contaminated area. This concentration is bactericidal for organisms more susceptible to sulfanilamide and, from animal experiments now in progress, appears bacteriostatic even for staphylococcus aureus hemolyticus to prevent infection of compound fractures.

"Actual measurement of the rate of absorption and excretion of sulfanilamide in

7. Wigglesworth, A. M., and Renkoff, Herman: Sulfanilamide Theraphy, M. Bull. Vet. Admin. 16:400, April, 1940.
8. Schwartz, Frank W., and Spark, Isadore: Sulfanilamide Therapy, M. Bull. Vet. Admin. 16:400, April, 1940.
9. Jensen, N. K., Johnsrud, L. W., and Nelson, M. C.: The Local Implantation of Sulfanilamide in Compound Fractures, Surgery, 6:12, July, 1939.
10. Bricker, E. M. and Graham, E. A.: Inhibitory Effect of Sulfanilamide, J. A. M. A., 112:2593, June 24, 1939.
11. Key, J. A. and Burford, T. H.: The Local Implantation of Sulfanilamide in Compound Fractures. South. M. J. 33:449-454, May, 1940.

two patients in whom known amounts were placed in surgical wounds reveals that approximately sixty hours are required for the drug to disappear from the blood. Marshall[12] and co-workers' studies of excretion of sulfanilamide show after a single large dose by mouth that practically all the drug is eliminated in twenty-four hours."

Key and Burford[11], using the method of treatment of Jensen, Johnsrud and Nelson, were greatly pleased with the results obtained over a nine months' period. They noted no general or local ill effects from the local use of sulfanilamide crystals in the wounds. In a personal communication Dr. Key states: "I believe that sulfanilamide locally is extremely important as a prevention of infection in compound fractures and in questionable operative wounds. I have even gone so far as to excise localized abscesses and suture the wound after placing sulfanilamide in the cavity and have gotten away with it."

"I am trying to determine whether or not it is of value in chronic osteomyelitis and in acute wounds which are definitely infected. At the present time I have only demonstrated its value in wounds in which the drug is placed as a preventive and which can be sutured. In my opinion the administration of sulfanilamide by mouth has relatively little effect on a local wound infection."

The local application of sulfanilamide in compound fractures, like the local application of the drug into the tooth socket, is similar to an 'in vitro' state. A high concentration is obtained, thereby exerting a higher bacteriostatic or bactericidal effect. Its effect is in line with Long's[13] observations that "high concentrations of sulfanilamide will exert either a bacteriostatic or a bactericidal effect in broth cultures seeded with small inoculums of streptococci, staphylococci, Escherichia coli communis, Escherichia communior, Shigella dispar, Bacillus pyocyaneus, Bacillys proteus, Bacilli aerogenes, pneumococci, Eberthella typhi, paratyphoid bacilli and certain other micro-organisms. These observations lead us to believe that 'in vitro' sulfanilamide may affect a wide range of micro-organisms, and it is likely that its mode of action 'in vitro' is the same regardless of the type of bacterium under investigation."

Colebrook, et al.[14] found that instead of being merely bacteriostatic, a 1:10,000 or 1:18,000 concentration of sulfanilamide was bactericidal in the presence of whole human blood or serum; in blood, inoculations of as many as 15,000 streptococci were destroyed in twenty-four hours.

Conclusions

A partial review of the literature on the value of the local use of sulfanilamide, both as treatment and prophylactic therapy in wounds is given.

Clinical results seem to justify our opinion that a wound treated locally is nearer an 'in vitro' than an 'in vivo' state. A high concentration of the chemical when used locally is maintained over a long period of time, resulting in a tremendous advantage over the systemic administration.

Because of the non-circulatory status of the lesion the result of the systemic administration of the drug in conditions as outlined is questionable.

12. Marshall, E. K.; Emerson, K. Jr.; and Cutting, W. C.: Para-Aminobenzenesulfonamide Absorption and Excretion: Method of Determination in Urine and Blood, J. A. M. A. 108:953, 1937.

13. Long, P. H.; Bliss, E. A.; and Feinstone, W. H.: Concentration of Sulfanilamide, J. A. M. A. 112:115, January 14, 1939.

14. Colebrook, Buttle and O'Meara, (cited by Long and Bliss (1).)

Factors in Disease.—Disease is usually the result not of a single factor but of a combination of factors. Over-emphasis on single etiology of diseases has been the outstanding mistake of medicine during the past half century. The patient's complaint is frequently the result of the additive effect of several types of disability of independent origins Thus circulatory collapse in a postoperative state is often the result of several chemical and physiologic factors. Severe dyspnea can be the result of the combined presence of a slight degree of anemia, rheumatic heart disease and bronchitis. Similarly, ataxia of pronounced degree may be caused by two disturbances of independent nature, such as syphilitic tabes and combined system disease of nutritional origin. A prolonged toxic psychosis following broncho-pneumonia may be brought about only in part by the central effect of the infection. The preexisting personality, alcoholism, and arteriosclerosis can play roles of equal importance in etiology. Hence, real diagnosis requires a painstaking analysis and keen evaluation of the relative role of all the active etiologic factors and all the bodily changes. How nearly correct one is depends on how deeply one wishes to look. To attach a medical label is not equivalent to making a good diagnosis; and correct prophesy of observations in the deadhouse is but an anatomoclinical correlation, and this is not identical with diagnosis of the patient as a psychophysical unit.—Soma Weiss, M.D.: The Medical Student Before and After Graduation, J. A. M. A. 114:1715 (April 27) 1940.

ORBITAL TUMORS AND THEIR SURGICAL TREATMENT

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The problem of determining the cause of a unilateral exophthalmos is one of the most interesting with which the ophthalmologist has to deal and is frequently a diagnostic challenge requiring every available aid. In order to gain a better understanding of the subject the 174 consecutive cases of unilateral exophthalmos caused by tumors and tumor-like lesions encountered at the Institute of Ophthalmology and the Memorial Hospital for the Treatment of Cancer and Allied Diseases during the past seven years have been analyzed.

This series includes only those cases in which the diagnosis was verified by biopsy or other surgical measures. Excluded were cases of non-surgical exophthalmos arising from exophthalmic goiter, arteriovenous aneurysm, sinus mucocele, cavernous sinus thrombosis, oxycephaly, and aneurysm of the ophthalmic artery. Included are 21 lesions which had not produced exophthalmos for one reason or another but which were considered potentially capable of doing so.

The study was undertaken with particular regard to the following factors:

(1) The distinguishing characteristics of the different types of orbital tumors and allied conditions important in differential diagnosis.

(2) The incidence of the various lesions. This is important in diagnosis and cannot be obtained from the isolated case reports appearing in the literature, consecutive cases being indispensible.

(3) The types of treatment indicated, especially from the surgical standpoint.

(4) The prognosis. This too cannot be determined from the literature, as the cases are almost invariably reported a short time after they have been observed and treated. An effort has been made in this study to follow cases long enough to determine their final outcome with some degree of certainty.

From the Department of Ophthalmology, College of Physicians and Surgeons, Columbia University, and the Institute of Ophthalmology of Presbyterian Hospital. Read before the Section on Ophthalmology and Otolaryngology of the Medical Society of the State of North Carolina, Pinehurst, May 14, 1940.

There are two conditions which simulate exophthalmos, and these should be ruled out as an initial step in making the differential diagnosis. The first is a unilateral myopia of 25-30 D.; the second, early hyperthyroidism (of which the patient may be unaware), in which the earliest eye manifestation is a retraction of the upper lid due to stimulation of the smooth muscle of Muller. When this is unilateral an exophthalmos appears to exist and can be ruled out only by means of an exophthalmometer.

Cases of slight exophthalmos resulting from the paralysis of one or more of the recti muscles, or from a rectus muscle tenotomized or greatly recessed at the time of a squint operation, should also be ruled out. These conditions may so reduce the retractive influence of the muscles on the eyeball that a proptosis of 2-3 mm. is produced.

It is interesting to note in this connection that if an extra-ocular muscle is paralyzed in the presence of other factors which tend to produce exophthalmos, the protrusion of the eye is greater than that which arises from any one single factor. A five-year old girl with complete paralysis of the left external rectus had an exophthalmos of 5 mm. The primary lesion proved to be an intracranial hematoma which pushed the lateral wall of the orbit inward. This increased the intraorbital pressure and gave rise to an exophthalmos which, in the presence of the paralyzed external rectus muscle, was considerably more extensive than it would otherwise have been.

Sources of Unilateral Exophthalmos

A unilateral exophthalmos produced by a tumor may arise from one of three sources: (1) A lesion primary in the orbit* (109 cases in this series); (2) a lesion in the region contiguous to the orbit (51 cases); or (3) a systematic or distal lesion (14 cases). In this study etiologic classification was made according to this grouping, and the causal lesions are listed in the order of their frequency. From the fact that the series was compiled in part from cases seen at the Memorial Hospital for the Treatment of Cancer and Allied Diseases, the proportion recorded here as arising from extra-orbital and systemic or distal lesions is probably unduly high.

* Reese, A. B.: Exophthalmos: Its Eye Complications; Its Causes From Primary Lesions in the Orbit; Its Surgery, Arch. Ophth. 14:41-52 (July) 1935.

Exophthalmos from Lesions Primary in the Orbit

Hemangioma	(5 with no exophthalmos)		25
Pseudotumor	(2 with no exophthalmos)		18
†Meningioma			13
Dermoid and epidermoid cysts	(6 with no exophthalmos)		10
Sarcoma			
Lymphosarcoma		5	
Rhabdomyosarcoma		2	
Osteogenic sarcoma		1	
Fibrosarcoma		1	
Myosarcoma		1	
			10
Neurogenic tumors			
Neurofibroma		8	(4 with no
Glioma of optic nerve		1	exophthalmos)
Neurilemmoma (neurinoma, Schwanoma)		1	
			10
Mixed tumor of lachrymal gland			9
Lymphoma			3
Hematoma			3
Osteoma			1
Xanthoma			1
Fibroma (from tendon sheath)			1
Osteitis fibrosa cystica			1
Lipoma	(no exophthalmos)		1
Lymphangioma			1
Zenker's Waxy Degeneration of rectus muscle			1
Tuberculous dacryo-adenitis			1
		Total	109

Hemangioma. The most frequent cause of proptosis due to a lesion primary in the orbit is hemangioma. Radiosensitive and usually encapsulated, it is fortunately one of the most satisfactory tumors to deal with. It is probably entirely congenital in origin, although it frequently grows so slowly that there is no sign of its presence until the patient is in the second or third decade. In this series the cases ranged in age from four months to fifty-five years. The average was twenty-five years.

Two noteworthy characteristics of this type of tumor are: (1) its failure to affect the motility of the eye, and (2) variations in its size and thus in the extent of the exophthalmos. These variations may be spontaneous, arising from a variable stasis in the venous circulation, or they may be produced by any maneuver which increases the congestion in the jugular area, such as compression of the vein, bending of the head, crying, coughing, etc.

Sometimes the hemangiomatous nature of the lesion is revealed by an extension of the growth sufficiently far forward to be seen subconjunctivally or subcutaneously. In rare instances there may be an associated non-elevated "nevus flammeus" or "port-wine" type of lesion on the lids or face. Although the skin lesion is present from birth it is not until later in life that an exophthalmos occurs from the growth of a hemangioma in the orbit, or that a hemangioma may manifest itself in the choroid, where it often produces glaucoma. Some hemangiomas are quite cirrhous, with few and extremely small blood channels; these may be difficult to diagnose clinically and even microscopically.

Pseudotumor. Although seldom mentioned in the literature, a chronic cellulitis or lymphogranuloma, which is usually called "pseudotumor", was found in this series to be the second most common orbital lesion to produce exophthalmos. It may resemble a real tumor so closely that clinical differentiation is impossible. Of 30 cases analyzed in the literature, 15, or 50 per cent, had had exenteration of the orbit for a supposed tumor which was proved by histological examination to have been a chronic inflammation. Further analysis of these cases revealed the following characteristics:

(1) The average exophthalmos produced was 7 mm.

(2) A firm mass, well-demarcated and discrete, was palpable in the orbit in half the cases.

(3) The vision was affected in two-thirds of the cases and usually returned to normal after regression.

(4) Complete regression, which often proceeded to enophthalmos and sinking of the tarso-orbital fascia, took place usually within four or five months.

(5) Occasionally there was prodromal transitory edema of the lid and conjunctiva some weeks or months preceding the appearance of the exophthalmos.

(6) The condition was never recurrent. (Since the analysis of these cases the writer has had the following experience with a case of pseudotumor of the orbit: M. H., a female, aged sixty years, had an exophthalmos of 5 mm. on the right side, and a mass was palpable through the lower lid and through the upper lid above the inner canthus. Biopsy showed it to be a lymphogranuloma. X-ray was given in fractional doses, and the tumor regressed in four months, with subsequent retraction of the tarso-orbital fascia. The patient was well

† Not all of these cases were primary in the orbit but due to the difficulty of dividing them accurately it seemed best to discuss them as a group.

for fifteen months, and then the left eye became proptosed 6 mm. A mass was palpable through the lower lid over the outer one-third. X-ray was given in fractional doses and there was complete rgeression in three months followed by retraction of the tarso-orbital fascia. Four months later a smooth, rather firm, non-movable mass, the size of a walnut, appeared in the right frontal region and was shown by aspiration biopsy to be a lymphogranuloma. This regressed in several months. The patient was well for two and a half years and then had an exophthalmos of 4 mm. on the left side. At the same time there was a smooth, rather diffuse, bony-hard mass, measuring 3½ cm. in diameter and elevated about 2 cm., on the left side of the forehead just lateral to the glabella. Roentgenograms revealed an increase in the soft tissue density and a small elevation of the outer table of the frontal bone. An aspiration biopsy showed that the mass was a lymphogranuloma and x-ray was administered in fractional doses. The exophthalmos disappeared in three months but the lump on the forehead required one year for complete regression. A year and a half later a mass measuring 5 cm. developed in the left supraclavicular region and was shown by biopsy to be a lymphosarcoma. This disappeared under x-ray therapy. A year later the patient complained of a swelling of the right foot. This was found to be due to a mass at the brim of the pelvis on the right side which was apparently pressing on the large vessels there. At the same time a mass as large as a good-sized grapefruit was palpable in the right upper quadrant. Under x-ray treatment these masses have disappeared. This last episode was four months ago and the patient is now free of complaints. At no time has the white blood count been increased or showed any abnormal differential count. This, then, is a case of pseudotumor of both orbits, in which the patient subsequently developed tumor masses elsewhere which proved to be lymphosarcoma.)

The most important points in differentiating a pseudotumor from a real tumor are the following:

(1) Primary tumors tend to occur at an early age; the average age for the pseudotumor is forty-five years.

(2) The onset of exophthalmos in primary tumors is insidious and gradual; in pseudotumors it is relatively sudden, the exophthalmos developing within a few weeks in most instances.

(3) Primary tumors of the orbit are never bilateral; pseudotumors affect both eyes in one-third of the cases, the second eye becoming involved within four to nine months after the first.

(4) Primary as well as secondary tumors of the orbit not infrequently show radiographic changes of the orbital bones; pseudotumors characteristically do not.

(5) Primary tumors usually cause no pain and no edema of conjunctiva or lids; pseudotumors cause some pain and some edema in half of the cases.

The microscopic examination of tissue in cases of pseudotumor shows chronic inflammation with certain distinguishing characteristics. There may be fibroblastic repair in all stages, from the denser hyaloid almost anuclear tissue of long standing to the delicate fibroglia and richly nuclear tissue of more recent production. Foci of lymphocytes are scattered through this fibrous tissue and occasionally real lymph follicles with germinal centers are encountered. Blood vessels are plentiful, their intima often showing proliferation to such an extent that the lumen appears almost occluded, and their media and adventitia showing thickening with sclerosis which has sometimes undergone hyaloid degeneration.

The etiology of pseudotumors is not known. There is no evidence clinically or histologically to indicate that they are tuberculous. Some observers believe them to be a very late manifestation of syphilis which has run its course and therefore gives a negative Wassermann. There are reports of regression of the exophthalmos under the usual treatment for late syphilis, but the effect may have been absorptive rather than specific; for the condition when untreated subsides in the course of several months. The histologic characteristics of the lesion, and in particular the vascular changes described above, are not inconsistent with lues but the sum total of evidence is inconclusive.

Two of the 18 pseudotumors of this series had not progressed to exophthalmos. Both of them exhibited diplopia, however, which is mentioned in the literature in about 25 per cent of cases as the first symptom of pseudotumor, preceding the onset of exophthalmos, and indicating that the tumor

mass is related to an extra-ocular muscle. Examination of biopsy material not infrequently shows the process to be associated with muscle tissue, and it may be in the extra-ocular muscles that the lesion has its origin. Lesions induced in the orbit by blood-borne diseases, such as metastatic cancer, trichiniasis, etc., usually implant themselves primarily in the extra-ocular muscles.

To sum up, pseudotumor is a clinical and histopathologic entity of unknown etiology. Although the clinical picture may closely resemble that of an orbital neoplasm, the age incidence, onset, course, and duration are characteristic. It may be possible in the future to classify pseudotumors according to etiology; for example, some may be found to be related to lymphogranuloma venereum, others to lymphosarcoma. I have seen one case in a patient who subsequently developed Hodgkin's Disease.

Meningioma. Next in order of frequency as a primary cause of exophthalmos in this series was meningioma, a tumor characteristically insidious in onset and slow in growth. The age of the patients ranged from twelve to fifty-eight years, averaged forty years. In most instances it is impossible to determine from the clinical findings alone whether a meningioma producing an exophthalmos is primary in the orbit or in the cranium; or, if it is in the former site, whether or not it has already extended into the cranium. If primary in the cranium, it often gives no neurological signs; however, the most frequent one and the first to appear is unilateral anosmia. This arises from the fact that the commonest site is the sphenoid ridge, where the tumor is brought into relation with the cribriform plate through which pass the filaments of the olfactory nerve. If the meningioma is primary in the orbit a disturbance of vision followed by optic atrophy is frequently the first manifestation and may precede the exophthalmos by several years. However, the possibility of a meningioma cannot be ruled out because of normal vision and normal fields, as they may persist in the presence of an optic nerve embedded in tumor tissue. Arising as it does from the sheaths of the optic nerve, the tumor lies in the muscle funnel at the apex of the orbit; in this position it is surrounded by the extra-ocular muscles, and their dysfunction is one of its early signs. It is also in close relation to bone, which it tends to invade, producing a hyperostosis; when this occurs in the apex of the orbit, extension is toward the cranial cavity. Close relationship to the optic foramen, moreover, as well as to the superior orbital fissure, further encourages the growth to spread directly to the cranium.

It is not uncommon for symptoms from an optic nerve sheath meningioma to exist for years before the diagnosis is made and treatment instituted. In one of our cases the patient had had poor vision and optic atrophy for five years and an exophthalmos for two additional years before operation.

X-rays are indispensable in diagnosing meningioma, and in the large majority of instances are our only means of determining the status of the lesion. X-ray findings in the 13 cases of this series indicated that the tumor was primary in the orbit in 4, but enlargement of the optic foramen in 2 of these suggested that there had been an extension toward the cranium. In one an exenteration with radical dissection at the apex of the orbit, followed by x-ray therapy given in fractional doses, failed to arrest the lesion. There was a recurrence three years after the operation and the patient died of an intracranial hemorrhage. In the other case there has been a local recurrence in the orbit, but no neurological signs had appeared when the patient was last seen, ten years after the operation. X-ray evidence of meningioma in the other 9 cases was atypical in 2, but definitely indicative of tumor primary in the cranium in 7. Meningioma primary in the orbit, therefore, was the exception in this series, and still more exceptional were cases confining themselves to the orbit without intracranial extension. When primary in the cranium the tumors produced exophthalmos by extension through, or hyperostosis of, the floor of the anterior cranial fossa, or by extension from the middle cranial fossa to the orbit *via* the superior orbital fissure.

Cushing[1] described intracranial meningioma as growing in two ways, either as an irregularly lobulated mass with a small stalk attaching it to the dura, or "en plaque" as a more or less flat and only slightly elevated mass tending to spread over the inner dural surface. The meningiomas arising in the orbit seem more often to grow in the former way, and those extending there secondarily more often in the latter.

1. Cushing, H.: The Cranial Hyperostoses Produced by Meningeal Endotheliomas, Arch. Neurol. and Psychiat. 1922, 8:139-152.

Meningiomas involving the orbit frequently present a serious treatment problem. Exenteration alone is rarely indicated because of intracranial extension or bone involvement. More frequently the situation lies in the domain of the neurologic surgeon as well as the ophthalmic surgeon, and in some instances the former alone would probably give the patient the best chance of recovery.

Hudson and Lundberg[2, 3] have both reported cases of orbital meningioma in which the tumor was incompletely removed, and in which there had been no recurrence approximately six years afterwards. This in no way rules out the possibility of a recurrence, however, for the tumor grows so slowly that it is not uncommon for one to reappear after an interval of many years; and there may be no symptoms for a still longer period, even twenty years or more. One of our cases showed exophthalmos twenty years ago; two years later a Kronlein operation was performed with incomplete removal of the tumor. There was a recurrence, and seven years ago an exenteration was done. Since then there has been a slow but steady regrowth of the tumor, but the patient is still living and well. The tumor now fills the orbit and manifests itself also as a mass in the temporal region. Neurological examination is negative. Another case had the first symptom eighteen years ago (poor vision with optic atrophy) and exophthalmos three years later. Roentgenograms at that time showed that the growth probably began in the orbit, but the optic canal was somewhat enlarged. A Kronlein with incomplete removal of the tumor was performed after another three years. Since then there has been a slow recurrence but the patient is living and well. Exophthalmometer readings taken twice a year have shown an exophthalmos of 10 mm. for the past six years. Neurological examination is negative.

Irradiation was applied to the recurrent tumors in both these cases, by x-ray in fractional doses to one and by radium to the other. Meningiomas are known to be radioresistant, and it is unlikely that the treatments had any material influence on the course of the disease.

Both Schuster[4] and Li[5] have reported instances of the metastasis of a meningioma through the blood stream.

Dermoid and epidermoid cysts usually occupy the orbital margin in the region of the brow temporally or, less often, nasally. Because of their predilection for this forward position they frequently do not produce exophthalmos. In a number of cases, however, they lie more deeply in the orbit or extend from the usual superficial location back along the bony wall to the retrobulbar region and give rise to proptosis. They are congenital and are usually detected in young individuals. The age range in our cases was from four months to thirty-six years, the average being fifteen years. After remaining dormant for years they may begin to enlarge slowly, and will sometimes grow so rapidly in the course of weeks or months as to produce pain. X-rays are frequently of great help in the diagnosis, as the cyst may produce a defect in the adjacent bony wall of the orbit.

Sarcoma of the orbit is as a rule a rapidly growing, highly malignant tumor occurring in very young individuals. Lymphosarcoma is an exception, appearing usually in older persons. Sarcoma of the orbit may arise from a great variety of cell types: connective tissue, muscle, nerve, periosteum, fat, or lymphocytes. In most instances it is growing so rapidly and is therefore so anaplastic that certain identification of the cell type is impossible.

Neurogenic tumors. Of the neurogenic tumors the neurofibroma is by far the most common, and its appearance is so characteristic that diagnosis may usually be made without difficulty. There is the *cafe au lait* pigmentation of the overlying skin, the multiple small neurofibromata, or the multiple pigmented nevi over the skin, and the extensive area locally involved by the tumor which may include not only the orbit but the lids, face, scalp, choroid, ciliary body, and iris, and may even extend into the cranium. The intra-ocular manifestations may produce glaucoma or buphthalmos. This tumor also tends to produce defects in the adjacent bones of the orbit, and x-rays may give valuable information. When the bony defect occurs in the roof of the orbit, the brain may herniate and give rise to a pulsating exophthalmos. In this series the ages varied from four to forty-one years. Half the cases with orbital involvement did not display exophthalmos.

2. Hudson, A. C.: Primary Tumors of the Optic Nerve, Royal Lond. Ophth. Hosp. Rep. 1912.
3. Lundberg, A.: Uber die primaren Tumoren des Sehnerven und der Sehnervenkreuzung, Inaug.-Diss. Stockholm Thesis, 1935.
4. Schuster, E.: Ein Fall von Psammon, Z. Augenheilk, vol. 62, 1927.
5. Li, T. M.: Arachnoid Fibroblastoma of the Optic Nerve, China Med. J. 41, 1927.

Glioma of the optic nerve is an exceptionally interesting condition and should be included in our discussion in spite of its extreme rarity. Composed of neuroglia, it is correctly called "glioma", but there has been some discussion as to whether the type cell is the astrocyte or the oligodendrocyte. Davis favors the former and believes therefore that the tumor should properly be called an astrocytoma. Lundberg, on the other hand, calls it an oligodendrocytoma. Davis also considers the tumor closely related to the neurofibroma with which it may be associated. It is extremely slow in growing and produces exophthalmos gradually in children in the first decade. X-rays may show an enlargement of the optic foramen and deformity of the sella turcica in cases of chiasmal involvement. Vision is usually affected before the onset of exophthalmos.

Verhoeff[6] discusses very interestingly the origin and growth of these tumors. Ordinarily a tumor arises from a small focus and as it grows it pushes aside and invades the surrounding tissue. In the case of glioma, whether it be in optic nerve, brain, or cord, the growth increases in size by causing the preexisting neuroglia in the vicinity of the growth to proliferate. Sometimes this glial proliferation is seen as far forward as the disc and contiguous retina, where in some instances it may reach considerable size and form a white or even a cystic mass; or it may be noted as far back as the hypophysis. Verhoeff's explanation of the proliferation of the neuroglia of the disc and contiguous retina, and perhaps also of the hypophysis, is that some abnormal stimulating factor is supplied in increasing abundance by the actively proliferating neuroglia of the tumor. This would also explain the remarkable statement by Hudson that "in spite of the frequency of incomplete removal, in no single case has a local recurrence in the orbit been recorded." Lundberg tells of two cases in which the tumor was not radically removed and there was no recurrence evident after ten-and-a-half and twenty years respectively. Seefelder has reported one case which recurred after three years, and this is apparently the only case of a recurrence on record.

These tumors may occur in both optic nerves or in the chiasm or brain and the optic nerve. This fact of multiple origins is sometimes important in determining the extent of the surgery required.

Mixed tumor of the lachrymal gland. The large majority of new growths of the lachrymal gland contain tumor tissue which is both ectodermal and mesodermal in origin. These growths are therefore called mixed tumors, and they constitute about 95 per cent of the neoplasms that arise from the lachrymal gland. Pure carcinoma of the gland is extremely rare and it is believed that most of the cases reported in the literature are in reality mixed tumors which have become malignant. Sarcoma of the gland has only been reported twice.

These mixed tumors are probably congenital, although the average age at which they manifested themselves was forty years in this series. They seem to arise from isolated displaced and undifferentiated embryonic rests and not from the developed gland tissue. Because they are potentially capable of forming many types of tissue they naturally vary a great deal in their component structures. The term cylindroma has been employed to designate one particular manifestation of this tumor in which the epithelial element predominates in cylinder formation with myxomatous stroma.

That this tumor occurs in patients middle-aged and older, that it arises from the site of the lachrymal gland, and that it tends to produce radiographic changes indicative of localized defects or hyperostosis of the adjacent bone, serve to make diagnosis relatively easy. Characteristically the tumors seem well encapsulated and not invasive and therefore inherently benign; but, as Sanders[7] points out, they must be viewed clinically as malignant growths because of the extremely high frequency of recurrence after excision, the marked tendency to local invasion not only of the orbital tissue but particularly of the orbital bones, and the frequency of distal metastases (Sanders 33 per cent). Death from intracranial extension is not infrequent (Sanders 42 per cent).

Other lesions. In this series the seven groups described above comprise 87 per cent of the cases of exophthalmos from causes primary in the orbit. Such causes as lymphoma, hematoma, etc., are so rare that they will not be discussed. It is a question, indeed, whether lymphoma and xanthoma should be considered strictly primary in the

6. Verhoeff, F. H.: The Mixed Tumors of Lachrymal and Salivary Glands, Jour. Med. Res., Bost., 1904-5, 13:319-340.

7. Sanders, T. E.: Mixed Tumor of the Lacrimal Gland. Arch. Ophth. Feb. 1939, 21:239-60.

orbit, as lymphoma may represent an early manifestation of a lymphatic leukemia and xanthoma of the orbit may be considered a part of xanthomatosis from faulty fat metabolism.

Exophthalmos from Lesions Adjacent to the Orbit*

From new growths in naso-pharynx			19
From new growths in sinuses			
Antrum	12		
Ethmoids and/or sphenoids	3		
Ethmoids	2		17
From malignant melanoma of choroid			
Extension from eye to orbit	2		
Recurrent after enucleation	5		7
Extension of epithelioma from lower lid into orbit			
Basal cell	3	(1 no exophthalmos)	
Squamous cell	1		4
Chloroma			1
From new growth of hard palate			1
From nose to orbit via tear sac			1
Mestastatic carcinoma to uvea with orbital extension			1
		Total	51

Naso-pharyngeal lesions. The commonest cause of exophthalmos from extension of an extraorbital lesion is a new growth originating in the naso-pharynx. It is anaplastic in nature and may be transitional cell carcinoma, lymphoepithelioma, or lymphosarcoma. According to Martin[8, 9, 10], these tumors advance through the foramen lacerum, come in contact with the internal carotid artery lying in the carotid groove, and extend along this vessel and groove to the superior orbital fissure, through which they enter the orbit.

The primary site is usually on the posterior wall in the region of the naso-pharyngeal tonsil and its lateral extension into the recessus pharyngis, and less frequently it is on the lateral wall. The primary site may still be quite small, even small enough to be overlooked (especially when it is in the fossa of Rosenmuller), after the tumor has already produced orbital symptoms or exophthalmos.

Sinus lesions. New growths of the sinuses which produce exophthalmos do so by direct extension into the orbit. These are also in the nature of anaplastic tumors which may be transitional cell carcinoma, lymphoepithelioma, or lymphosarcoma. In this series the antrum was the commonest primary site of lesions producing exophthalmos, probably because the antrum is the sinus most commonly affected with cancer. Cancer of the ethmoid in all likelihood leads to exophthalmos in a high percentage of cases because (1) only the thin bony lamina papyracea separates the ethmoids from the orbit, and (2) cancer of the ethmoid is frequently associated with infection which sometimes produces an orbital cellulitis.

Eye and lid lesions. Exophthalmos that occurs from the extension of a new growth in the eye or lids is usually not difficult to explain. An exception to this in this series was a case of malignant melanoma of the choroid which became necrotic and in which the necrotic tumor tissue gave rise to a severe panophthalmitis with orbital cellulitis clinically resembling a lesion produced by infection. The interior of the eye could not be seen and the underlying cause could have been overlooked.

The three groups described above comprise 90 per cent of the cases of exophthalmos caused by lesions adjacent to the orbit.

Exophthalmos from Systemic or Distal Lesions.

From metastatic new growths		
From breast (carcinoma)	3	
From suprarenal gland and/or retroperitoneal region (sympathicoblastoma, neuroblastoma)	2	
From thyroid (carcinoma)	1	
From lung (lymphosarcoma)	1	
From tonsil (carcinoma) to orbital bone	1	
From unknown site (carcinoma)	1	9
Hodgkin's Disease:		
To lachrymal gland (no exophthalmos)	1	
To orbital bone (no exophthalmos)	1	2
Lymphatic leukemia		1
Schuller-Christian disease		1
Gumma		1
	Total	14

Diagnostic Procedure

The differential diagnosis of unilateral exophthalmos with respect to etiology is simplified by the fact that a large proportion of cases arise from a relatively small number of causes. In this series 147 cases, or 85 per cent, were traceable to only twelve different types of lesions.

X-ray. A roentgenologist can be of immense help in differentiating these orbital

* According to a personal communication from Dr. R. L. Pfeiffer, the commonest cause of unilateral exophthalmos recorded by the X-ray Department is a mucocele. Such cases, as stated at the outset, were not included in this series.

8. Martin, H. E.: Cancer of the Nasopharynx. To be published.

9. Martin, H. E. and Stewart, F. W.: Advantages and Limitations of Aspiration Biopsy. Amer. Jour. Roentgen., February, 1936, 35:245-47.

10. Martin, H. E. and Ellis, E. B.: Aspiration Biopsy. Surg., Gynec., and Obst., October, 1934, 59:578-89.

lesions, particularly if he is also an ophthalmologist or is familiar with this particular problem. X-rays are also extremely helpful in determining the course of treatment and the prognosis, particularly in showing whether or not bone invasion is present in cases of meningioma and mixed tumor of the lachrymal gland, and in indicating the character of the optic foramen, which frequently signifies whether a meningioma or a glioma of the optic nerve remains entirely in the orbit or has extended into the cranium.

Biopsy. In many instances a biopsy is necessary for diagnosis. It is generally believed that the removal of a piece of tissue for this purpose from a surface lesion does not tend to produce metastasis or to increase local dissemination. Orbital lesions, however, lie deep beneath intervening normal tissue and are usually encapsulated. In such cases biopsy by surgical incision may require some dissection into important normal structures and may be followed by unfavorable consequences on the course of the growth. Ewing's[11] objections to surgical biopsies in such instances are that the procedure modifies the clinical setting, breaks down the natural local barriers, favors fungation of the growth through the opening in its capsule into the surrounding normal tissue, and in some instances encourages metastasis. These objections of course are less valid when the indicated therapeutic measures are carried out without delay.

Aspiration biopsy. In many instances surgical biopsies can be avoided by employing aspiration biopsy. By this method, advocated by Martin, it is possible to obtain a histological diagnosis of a tumor in a very short time, and the procedure may be carried out in the clinic or the office under local anesthesia. The pathologist cannot be expected to give as much information from such biopsies as he can from larger pieces of tissue, but it is possible to say in most instances whether or not the tumor is malignant and often what type of tumor it is, particularly if the pathologist has the clinical data at hand and is familiar with the tumors that are to be encountered in the orbit. A granuloma may be diagnosed in this way, and if only blood is aspirated from several sites, a hemangioma can be assumed. A negative report, on the other hand, has little diagnostic value. In a series of over 3,500 cases aspirated at the Memorial Hospital, including material from such regions as the lungs, liver, spleen, prostate, and neck, as well as from the orbit, there have been no untoward sequelae in the form of local damage and no proof of increased local invasiveness or earlier or more frequent metastasis.

The equipment required is an ordinary 18 gauge needle, 5-10 cm. in length, and a 20 cc. record syringe. Glass slides are necessary for smearing the specimen, and a specimen bottle with 10 per cent formalin is needed if a portion of the tissue is to be treated as regular biopsy material.

The technique is to inject novocain locally and make a small incision through the skin at the site of the intended puncture. This opening in the skin facilitates the insertion of the needle and prevents contamination of the aspirated material by surface epithelium. The needle attached to the syringe with the piston closed is inserted until the point is felt to engage the suspected lesion, the piston is partly withdrawn to produce a vacuum, and the needle is then advanced further into the lesion. With the vacuum maintained throughout, and with the point of the needle always within the tumor, the needle is withdrawn somewhat, advanced again, and again somewhat withdrawn. Tissue from the tumor mass enters the needle and is held there by the vacuum. Before the needle is withdrawn completely the piston must be released slowly and the syringe detached. The needle is then withdrawn separately and its contents are slowly expelled onto a glass slide. The material may be prepared for examination either by making a smear and staining it immediately or by treating the small piece of tissue as regular biopsy material.

Surgical biopsy is usually a simple procedure technically, especially when a mass is palpable near the surface, but it may be unsatisfactory when there is no indication of the location of the lesion in the orbit. Approaching the lesion through the upper lid should be avoided whenever possible. If such a route is indicated, precautions should be taken to avoid the levator muscle.

A note of warning should be sounded regarding the removal of biopsy tissue in cases of pseudotumor. Because of the vascular changes occurring in this lesion, the tissue tends to bleed profusely. This is a general bleeding and upon one occasion in the writer's experience it was necessary to pack the wound and do a secondary closure. If

11. Ewing, J.: Neoplastic Diseases.

the bleeding in these or in any other cases is great, so that there is sufficient dissemination of blood throughout the orbit to provoke an increase in the exophthalmos and endanger the cornea from exposure, then the lid margins should be adhered and a very firm pressure dressing applied.

Surgical biopsies are particularly contraindicated in cases of mixed tumors of the lachrymal gland, especially when the proposed treatment is not to be carried out immediately.

Surgical Procedure

Surgical treatment of unilateral exophthalmos consists of one of three procedures. These are: (1) local excision of the lesion, (2) enucleation combined with local excision, or (3) exenteration of the orbit.

Local excision of lesion. For the successful local excision of an orbital lesion, the lesion must be well localized or encapsulated. Lesions that frequently fulfill this requirement are hemangioma, meningioma, dermoid cyst, mixed tumor of the lachrymal gland, neurinoma, lymphoma, hematoma, fibroma, lipoma, lymphangioma, and glioma of the optic nerve.

When these lesions recur after incomplete removal they usually become increasingly more diffuse and disseminated. This is particularly true of the mixed tumors of the lachrymal gland, which seem after each incomplete surgical excision to become more locally destructive, invasive, and metastogenic. They tend to recur even when so well encapsulated that a complete removal has been anticipated at the time of original excision. Sanders attributes this extremely high recurrence to the tendency of the tumor to invade the bone and to the fact that when it is removed by being "shelled out" of the capsule, tumor tissue which has invaded the capsule apparently remains behind. In these cases, therefore, the excision should be as wide as possible. If the tumor is invasive an exenteration is indicated, and if there is bone involvement the bone should be resected if possible.

Sometimes the capsules of the various lesions adhere to adjacent structures. In the case of the extra-ocular muscles this often causes injury when the lesion is removed without the globe. This is particularly true of the meningioma which lies in the apex of the muscle funnel in direct relationship to the extra-ocular muscles. When one or more of these muscles is injured in this way it may be advisable to fix the eye in the primary position, so that the repair tissue formed later in the orbit around the globe will fix it in good alignment and with no proptosis. This can be accomplished by passing a silk suture through the lid margin and through the episclera at the limbus, nasally and temporally, and tying over the surface of the lids. A tenotomy of the opposing muscle may also be advisable.

The location of a lesion in the orbit determines its accessibility for removal. It may be located in the muscle funnel, as are meningioma and glioma of the optic nerve, but the majority of lesions are outside the muscle funnel and, luckily, are located temporally so that they can be very satisfactorily approached by a transconjunctival route, in the following manner: A canthotomy is performed and the fibers of the external canthal ligament, together with the tarso-orbital fascia, are divided. The conjunctiva is incised along the fornix to the vertical meridian above and below the canthotomy. This conjunctiva is dissected free. If the tumor is in the muscle funnel, the external rectus muscle must be severed at its insertion. By retracting the globe nasally, very good access to the orbit is obtained. In our experience any lesion can be removed as satisfactorily in this manner as by the Kronlein method. If a little more exposure is needed some of the margin of the orbit temporally can be removed by rongeur forceps without causing any cosmetic blemish, but this additional procedure is rarely necessary.

The temporal transconjunctival approach gives sufficient access to the orbit for the removal of tumors located anywhere but nasally. When they occur nasally neither this approach nor the Kronlein is satisfactory because, if the muscle funnel must be crossed in approaching the lesion, there is such extensive damage to the extra-ocular muscles, the posterior ciliary vessels and nerves, and the optic nerve that it is not feasible to attempt to retain the globe. If the lesion is definitely in the nasal side of the orbit, it should be possible to use the same transconjunctival approach nasally, although I never have had occasion to do so.

In cases of tumor of the optic nerve (glioma or meningioma) it may be advisable in rare instances to excise the tumor, leaving the globe *in situ*. The transconjunctival

approach can be used, the external rectus reflected, the tumor excised at the apex of the orbit, and the globe with the tumor attached everted by extreme rotation of the eye. This gives satisfactory exposure for excision of the tumor from the globe. Fortunately the tumor frequently leaves about 2 mm. of unaffected nerve adjacent to the globe, and this is sufficient to permit the excision of the nerve from the globe free of tumor tissue.

Small lesions located in the region of the lachrymal gland can be approached satisfactorily through the outer third of the skin of the upper lid. Care should be taken to avoid any injury to the levator muscle.

Enucleation with local excision. Occasionally when the orbital lesion is extensive but localized, or inaccessible for local excision leaving the globe *in situ*, it is well to enucleate and then do an excision, so that the patient may later wear an artificial eye.

Exenteration. An exenteration of the orbit is indicated in extensive involvement with any tumor, in all cases of sarcoma except lymphosarcoma, which is quite radiosensitive, in diffuse extensive recurrence of an excised tumor, in extensive orbital extension of an intra-ocular tumor, and rarely in orbital involvement secondary to a new growth of the nasopharynx, sinuses, or lids in order to facilitate irradiation or to relieve pain.

In performing the exenteration, the skin of the upper and lower lids is left intact. The skin of the upper lid is inverted upon the roof of the orbit and the skin of the lower lid is used similarly to cover the floor of the orbit. If the remainder of the orbit is allowed to granulate, discharge occurs over a long period of time and frequent dressings are required, sometimes for several months. A Thiersch graft placed in the orbit at the time of the exenteration will take readily on the bare, deperiosteomized bone and leave a clean, non-discharging, odorless orbit one week after the operation.

The Profession of Medicine. — The fact must be accepted that one cannot expect to become a skilful practitioner of medicine in the four or five years alloted to the medical curriculum. Medicine is not a trade to be learned but a profession to be entered. It is an everwidening field that requires continued study and prolonged experience in close contact with the sick.—Peabody, Francis W.: Doctor and Patient, New York, The Macmillan Company, 1939.

THE CLINICAL INTERPRETATIONS AND APPLICATIONS OF ELECTROCARDIOGRAMS

VERNE S. CAVINESS, M.D., F.A.C.P.

RALEIGH

Probably the chief value of the electrocardiogram is as an aid in determining the quality of the heart muscle. Electrocardiography has fallen into some disrepute, owing to improper interpretations and applications; however, there is too much potential value in it for it to be discarded because of errors that represent human equations rather than a defect in the procedure.

Interpretations of electrocardiograms should be made only by physicians with adequate training and experience. Failure of physicians to recognize the importance of this safeguard for their patients is resulting in a rather widespread demand for an American Board of Cardiology for the certification of those physicians who are adequately trained for such work.

One of the dangers of electrocardiography is that erroneous interpretation of electrocardiograms may create psychoses in persons possessing approximately normal hearts. Another is that of creating a false sense of security in a patient with a damaged myocardium and possibly permitting him to undergo an elective surgical operation or to engage in too strenuous activities.

One should never attempt to read too much into an electrocardiogram. It is merely an aid to a diagnosis, and should be considered as an integral part of a composite picture. The history of the illness, the general physical examination, and the stethoscopic examination of the heart—at times supplemented by exercise tests—must be considered along with an electrocardiogram in any comprehensive heart study.

One should not forget that following an acute coronary occlusion, a number of hours may elapse before the electrocardiogram shows the effects of the accident (figs. 1 and 2). A very small infarct involving vital areas, such as the bundle of His, may cause death before any electrocardiographic evidence of the accident is obtainable.

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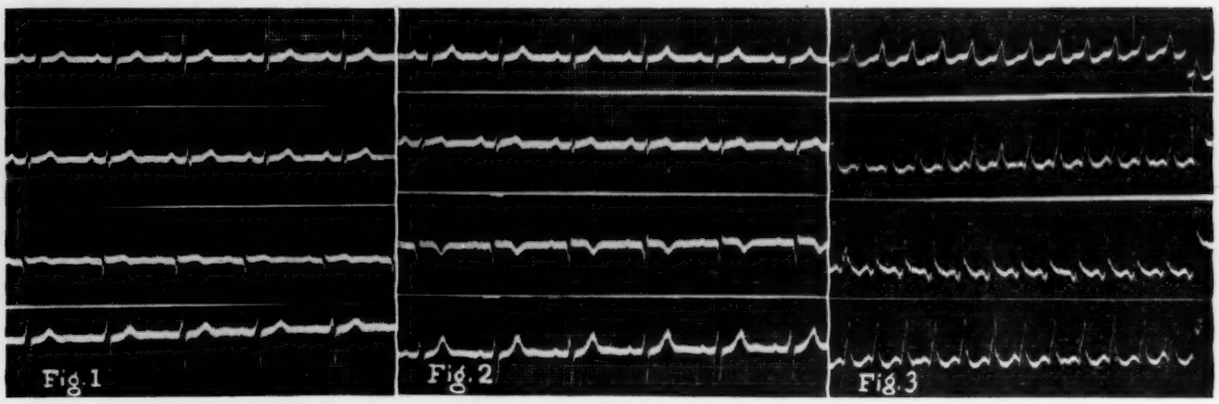

Fig. 1. This tracing was made four hours after a severe prolonged attack of precordial pain, radiating down the left arm. It shows no evidences of the acute attack, but does show evidences of the coronary occlusion that occurred two years previously.

Fig. 2. This tracing was made twenty-four hours after figure 1. It shows the effects of an acute coronary occlusion.

Fig. 3. This tracing shows auricular flutter, 1-1 ratio, in a heart with a very old chronic infarction.

Rhythm

Arrhythmia not only causes great distress and worry to the patient, but also often presents a difficult problem of diagnosis to the attending physician. Rules for differential diagnosis of arrhythmias are easily made, but unfortunately are not sufficiently reliable in clinical practice. For example, premature ventricular contractions from some insignificant cause may produce such an irregular rhythm of the heart and pulse as to be indistinguishable from auricular fibrillation without an electrocardiogram.

The sinus arrhythmia which occurs in young people has no clinical significance.

Tachycardia may be due to hyperthyroidism, to some emotional stress, or possibly to badly damaged myocardium; or it may be due to auricular flutter (fig. 3), paroxysmal auricular or ventricular tachycardia, or to a series of extrasystoles. Very often a clinical differentiation without an electrocardiogram is impossible.

Heart block, whether partial or complete, often must be distinguished from other conditions, such as auricular fibrillation or extrasystoles. Coupling of beats, bigeminal pulse, pulsus alternans, and other conditions demand careful differentiation with respect to etiology and for purposes of therapy. Here again an electrocardiogram is indispensable.

In a study of cardiac rhythm, the value of the electrocardiograph is rarely questioned. The legal dictum *res ipsa loquitur* applies here, except that there must be an accurate interpretation of the tracing. Occasionally tracings are made which require ample experience for interpretation; interpretation from a book of models is not always possible. Figure 4 is a good example of this. Here the P waves are superimposed on T waves in a tracing from a rheumatic heart showing a very long conduction time. Figure 5 is a later tracing from the same heart showing a slower heart rate and a shorter conduction time. Here the P and the T waves appear separately.

The mere existence of a cardiac irregularity need not indicate a grave prognosis, nor need it demand treatment. Auricular fibrillation may defy all treatment, yet not prevent the victim from engaging in an active occupation. Life insurance companies often issue insurance at nearly standard rates to patients with extrasystoles. Sinus arrhythmia may frighten the novice electrocardiologist; yet the patient may live to a very ripe old age.

Not so benign, however, are the tracings from digitalis poisoning. These should usually be accepted at their face value, and digitalis stopped. It is well to remember that if small doses of digitalis do not produce desired results, over-dosage is likely to make the condition worse.

Myocardium

The heart muscle is the power that keeps blood circulating through the entire vascular system. Anything which causes an impairment of function of the myocardium decreases the blood flow and lowers the efficiency of the body as a whole.

The quality of the myocardium depends on many factors. A first essential for good function is a full supply of good arterial blood flowing through coronary arteries.

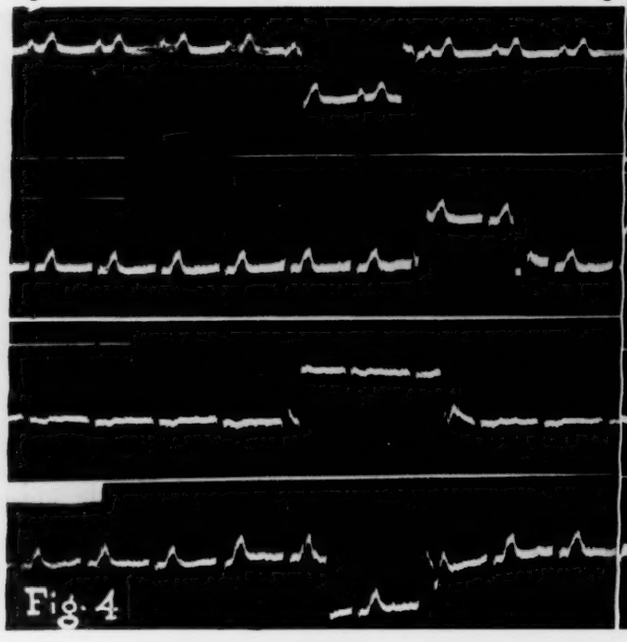

Fig. 4. This is a tracing from a case of rheumatic heart disease, without arthritis. P waves are superimposed on T waves.

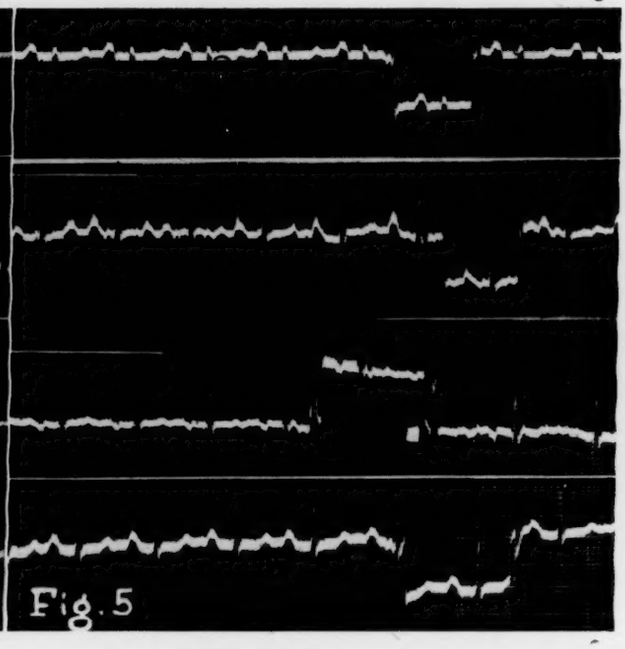

Fig. 5. This tracing shows improvement over figure 4. The rate has slowed and the conduction time is shorter.

Valves are secondary in importance, and only rarely do they seriously affect the heart efficiency. It is an aphorism that heart murmurs never kill anyone. Various infections have a predilection for heart muscle, producing severe grades of myocarditis or of myocardial degeneration. Among these may be mentioned syphilis (figs. 6 and 7), rheumatic heart disease (figs. 4 and 5), tuberculosis, scarlet fever, and diphtheria. The first two produce effects that are frequently seen in any active cardiac clinic.

Pressure on the heart, as from tympanites, pericardial effusion (figs. 8 and 9), pleural effusion, empyema, tumors, etc., also depresses the efficiency of myocardium.

The electrocardiogram furnishes the best index to the quality of the myocardium, and to the condition of the coronary arteries.

Coronary Arteries

It is rather difficult at times to distinguish between diseases of the myocardium and diseases of the coronary arteries. Some clinicians make no effort to differentiate between diseases of the two, holding the belief that, with rare exceptions, diseases affecting the muscle also affect the coronary arteries.

It appears probable that all angina pectoris, as well as the pain from occlusions, arises in the coronary arteries or in the muscle supplied by arteries occluded. Electrocardiograms show evidences of coronary artery sclerosis quite early—often before any clinical signs or symptoms appear. Electrocardiograms are reasonably accurate if associated with clinical findings in making diagnoses of coronary artery occlusion, especially when it is possible to compare tracings made on different dates (figs. 1 and 2).

For a reliable evaluation of the myocardium and coronary arteries of any heart, the age and degree of senility as evidenced by the patient's general appearance must be considered. All cardiac changes are relative and usually are in some proportion to the age. Too many clinicians disregard age, premature senility and other important factors.

Angina pectoris and coronary occlusion are the conditions most frequently encountered affecting the coronary arteries. Many cardiologists consider angina pectoris to be due to spasm of coronary arteries even if not actually due to small occlusions. It is true that at autopsy scars from minute arborization blocks are found without a reliable history to substantiate occlusion symptoms. Also, occasionally, painless occlusions occur. These may be recognized antemortem from symptoms of weakness, shortness of breath, and evidences of cardiac decompensation, and the diagnosis may be corroborated by the electrocardiogram.

Statistics of the mortality from surgical procedures which are purely elective are staggering. For many such types of opera-

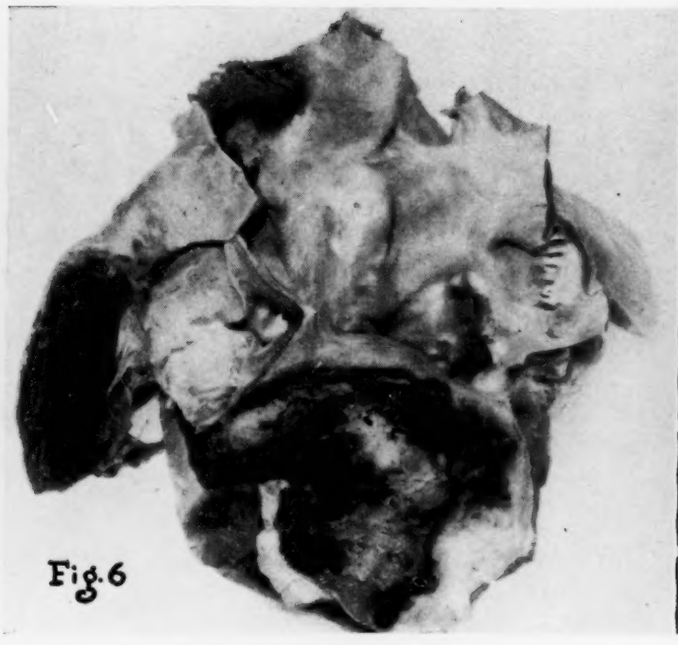

Fig. 6. This heart presents a button hole mitral valve with almost complete obstruction. It also presented an intractable auricular fibrillation. It is from an old syphilitic patient who had had insufficient treatment for syphilis.

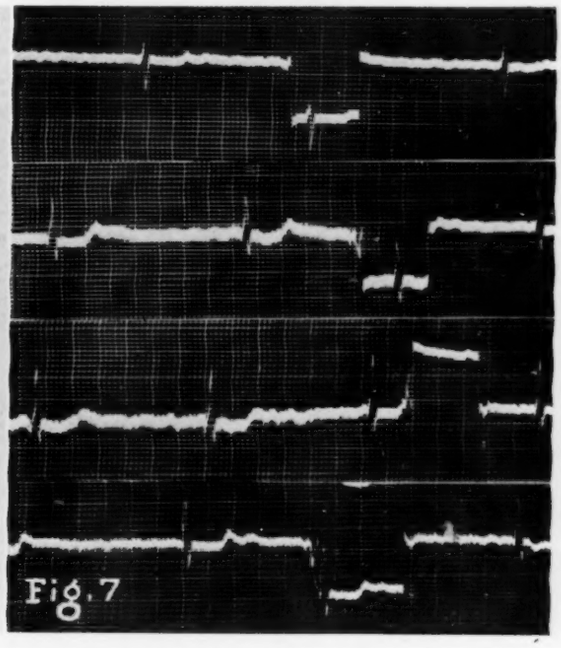

Fig. 7. This is the tracing from the heart shown in figure 6.

tions the mortality may run twenty per cent or higher. Quite a number of hospitals have reduced this inexcusable mortality to a negligible factor by the routine employment of electrocardiographic studies in patients of middle life or older. The patients agree with hospital authorities that it is better to live with an infected gall bladder or a pyosalpinx than to die from surgically produced coronary occlusion.

Drug Effects

Definite changes are produced in the heart action and in electrocardiograms by digitalis, strophanthus, and probably by nicotine in persons who are hypersensitive to its action. In the study of any heart, careful consideration of previous treatment is essential.

Notorious errors in the interpretation of electrocardiograms which have been widely publicized could have been obviated by a reasonable consideration of previous drug therapy and an intimate knowledge of characteristic electrocardiographic changes, even if a reliable history was lacking. Toxic effects of digitalis are shown in the electrocardiogram by coupling of the beats—i. e., a more or less normal complex followed by an extrasystole, and this followed by a compensatory pause. Or, it may appear as a prolongation of the auriculoventricular conduction time. Or, frequently, there may be seen characteristic changes in the R-T or S-T segments, as a concave line instead of a convex line (fig. 10).

Cardiac Psychoses

It is not surprising that many people should fear the development of cardiac disease, when the high rank of cardiac disorders as causes of death are considered. Various gastro-intestinal disorders produce symptoms that simulate the shortness of breath and precordial pain of heart disorders. Probably many have had experiences similar to one which occurred in my interne days, when I was wakened at 3 a. m. by a patient at the door of the accident ward who stated that he was dying of acute heart failure and could not wait for a trolley or taxi, but had run seventeen blocks to see a physician.

Many people have fixed delusions of imaginary heart disease; they are actually ill and disabled as though there were definite cardiac pathology present. Work of any type is impossible for them. They know it would kill them. This mental illness can be intensified by the possession of too much disability insurance. But while we pity such people, possibly they are not to be blamed. Many of them have been told by their trusted physicians (without an electrocardiogram) that they have a severe heart disease, and have been put to bed for the conventional six weeks. After a period of gradually in-

Fig. 8. This heart is from a patient with acute rheumatic fever, recurrent, with adhesive pericarditis. The pericardium is shown to be approximately as thick as the wall of the ventricle.

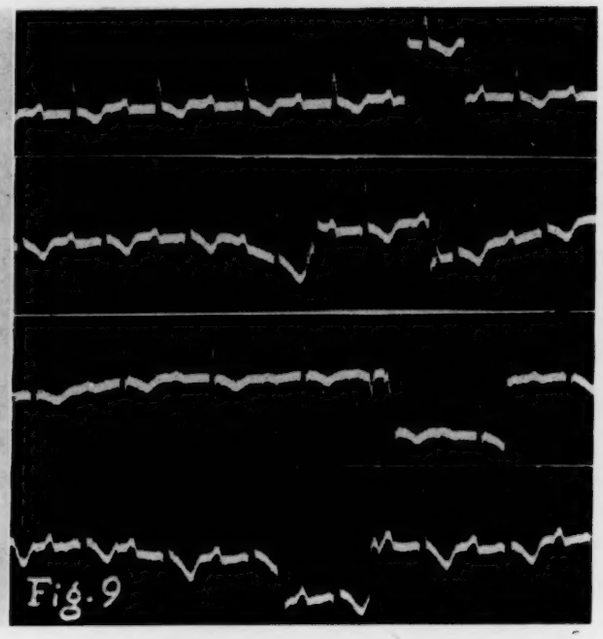

Fig. 9. This tracing was made from the heart shown in figure 8.

creasing exercise they go back to work, but when they resume their old habits of over eating, the pain returns. Any type of precordial distress must represent a very dangerous heart attack to such a person. Such patients can usually be cured by the following procedures.

First of all, a normal electrocardiogram is essential. This can be explained in detail to the patient, and consultants may be called in to support the views of the attending physician or cardiologist.

The digestive disorder, from whatever cause, must be relieved. This may be difficult, but it will cure a large number of these patients.

A psychiatrist may be needed for some patients.

It would be impossible to determine the damage done by one physician who formerly did a great many insurance examinations. He discovered that if he recorded some minor heart defect in his reports, the companies would request that he fill out a heart blank and pay him an additional two dollar fee. The heart blanks carried normal reports and the applicants secured their insurance, often at substandard rates. Now he makes no insurance examinations, but the applicants he examined continue to bedevil the cardiologists. They know that they have heart trouble, partly because they still have to pay extra for their life insurance.

Unless the clinical picture leaves no doubt of the diagnosis, it is unfair to the patient to put him to bed for prolonged periods of rest without definite electrocardiographic proof of coronary occlusion. Our records show the electrocardiogram of a physician who was put to bed with a diagnosis of coronary occlusion based on precordial distress. After a few days of restricted diet he felt so much better that he left the hospital and had an electrocardiogram made. There is nothing wrong with the electrocardiogram, and after ten years he is still working full time, though with fewer dietary indiscretions.

Dr. J. B. Herrick[1], before the meeting of the American College of Physicians in 1938 mentioned thirty conditions that may be confused with coronary occlusion. Very prominent in his list was cardiac neurosis. He stressed the need for electrocardiograms in making the differential diagnosis.

Conclusion

Electrocardiography is one of the most valuable aids available in the study of heart conditions; however, its value is always dependent on very careful interpretations of the tracing and a reasonable application of these findings to the other clinical and laboratory data.

1. Herrick, J. B.: On Mistaking Other Diseases for Acute Coronary Thrombosis, Ann. Int. Med. 11:2079 (June) 1938

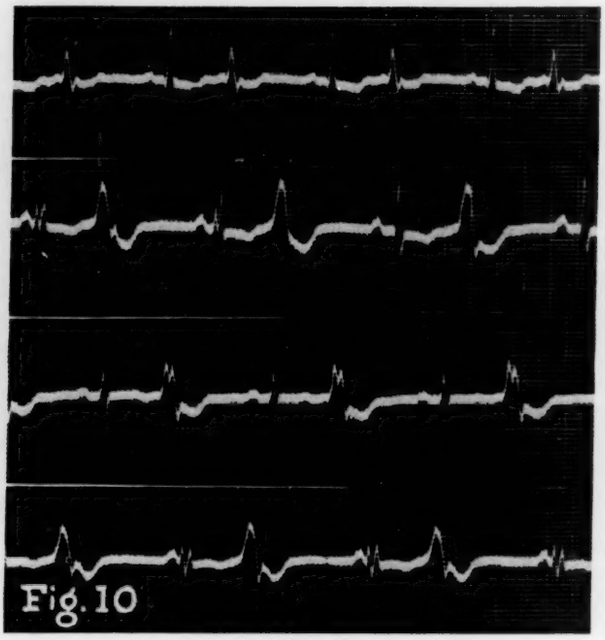

Fig. 10. This tracing shows digitalis effect in a heart that has previously suffered an occlusion.

Abstract of Discussion

Dr. T. L. Umphlet (Raleigh): The subject which Dr. Caviness has discussed is of importance not only to us, but to every branch of medicine. The electrocardiogram is of value in determining the diagnosis of the cardiac patient, and lends valuable aid in the differential diagnosis of other conditions as well. By using it along with other studies we are able in most cases to give a true picture of any patient. I feel, with Dr. Caviness, that there should be a closer relationship between electrocardiography and other branches of medicine.

In regard to the interpretation of the electrocardiogram following digitalis therapy, it is often difficult to give a true interpretation from a single tracing, because the changes following digitalis therapy so often simulate the changes found in other conditions. This difficulty can be overcome in most cases by the use of serial tracings.

Patients who have indefinite precordial pain not typical of angina pectoris present a serious problem. Cases with definite angina pectoris attacks receive treatment regardless of the electrocardiographic evidence, because we know that in at least 25 per cent of these cases the electrocardiogram will fail to show any evidence of pericardial disease. Dr. Caviness has mentioned the use of exercise tests in helping to make a diagnosis in these difficult cases. In those cases with indefinite pain the problem is not easy. In some cases the serial electrocardiogram will show progressive evidence of coronary sclerosis. Frequently the electrocardiogram will be negative or doubtful, and will remain so until the patient has a definite coronary occlusion. For this reason I do not feel that the negative evidence should preclude the possibility of coronary artery disease.

Dr. Caviness has pointed out that following acute coronary thrombosis it may be hours or even days before there are typical electrocardiographic changes. This is probably due to the fact that the changes of the electrocardiogram are not due to the thrombosis, but to the resulting myocardial damage.

THE JOINT RESPONSIBILITY FOR MATERNAL WELFARE IN THE LIGHT OF CURRENT SOCIAL TRENDS

W. Z. Bradford, M.D.

Charlotte

The outstanding contributing causes of infant and maternal mortality in North Carolina are economic and social in their origin. Poverty, ignorance and neglect constitute the background of over 75 per cent of the maternal deaths occurring in this state. Analysis of mortality rates throughout the South emphasizes the fact that in the great majority of pregnancies which proceed to a fatal termination the patients were in a grave physical condition at the time of the first medical contact. The need for organization of available facilities and for competent personnel is apparent. The complaint of the practicing physician has usually been that the case was hopeless when it reached his hands.

In a recent analysis of 515 maternal deaths from toxemia of late pregnancy in this state made by the speaker from questionnaires prepared by the Bureau of Vital Statistics of the North Carolina State Board of Health the outstanding contributing factor was found to be neglect. Only twelve of these patients received competent prenatal care and medical assistance. The majority were seen for the first time late in pregnancy either in convulsions or with advanced toxemia. Many were not visited by a physician until after death. The role of illegitimacy, which predisposes to neglect, was striking. Twenty-two per cent of the maternal deaths from toxemia occurred in women who were illegitimately pregnant. Other studies of maternal mortality from sepsis and hemorrhage likewise emphasize the fact that the social and economic handicaps confronting a large proportion of the population in our communities are also factors in death from these conditions. There is little that the practicing physician alone can do to correct this situation. It is estimated that 50 per cent of the pregnant women in North Carolina can not afford to purchase competent obstetrical care. No amount of education of the public can overcome this economic factor. Likewise no amount of postgraduate

Read before the Section on Public Health and Education, Medical Society of the State of North Carolina, Pinehurst, May 14, 1940.

training of general practitioners and specialists in the field of obstetrics can materially reduce the mortality in those cases where toxemia, sepsis or hemorrhage is far advanced. The efficiency of medical therapy depends upon early recognition of obstetrical pathology, followed by prompt and competent treatment. While maternal welfare is a medical responsibility it is also a public health responsibility, a community responsibility and a governmental responsibility.

The increased social and medical activity of the federal government, particularly in matters pertaining to infant and maternal welfare, is the dawn of a new era. The program is one of far reaching implications and demands the thoughtful consideration of the medical profession. The disbursement of large funds through the state boards of health places our public health departments in a position of dual responsibility. Their obligations to the citizens of our commonwealth and their awareness of the crying needs of maternity and infancy necessitate an active participating program in this new social structure. Equally as important are the obligations of public health departments to the practicing physician and to the principles of democracy and individualism which have been the foundation stones of medical progress and development in this country. The active practice of medicine is distinctly not a legitimate public health activity.

To draw a sharp line of demarcation between preventive and curative medicine is an impossibility. Where one stops and the other begins cannot be definitely defined when consideration is given to the question of the prolongation and conservation of life in contradistinction to the prevention of a particular disease. This is especially true in problems of maternal and infant welfare. There is no field of medicine where public health and private practice are more interlocked and closely entwined than in obstetrics. It has been aptly demonstrated that prenatal care, unless followed by a competent delivery service—including facilities and organization for the scientific treatment of pathology complicating pregnancy, and adequate postpartum and neonatal supervision—is of limited value except as an educational measure. In the Charlotte Maternity Clinic an infant mortality rate of over 8 per cent existed during the years this clinic operated as a prenatal service only; in 1939 the uncorrected infant mortality in a series of nearly 1000 deliveries of indigent patients was 4 per cent.

Dr. I. C. Riggin in his chairman's address before the Section of Preventive Medicine and Public Health at the St. Louis meeting of the American Medical Association presented in masterful fashion the necessary interdependence of the practicing physician and the public health physician in the expanding public health program. To quote at length: "Medical conferences and clinics which are conducted by health departments should be used as a means of education and to bring to the attention of the public the value and need of medical and public health services. It has been through the demand of the citizens and physicians that tuberculosis diagnostic clinics and sanatoriums have been established and thus become recognized definitely as a public health function."

"Maternity centers have been established in many sections throughout the country, and not only have there been developments in this field which have been educational in character, but in many instances, definite medical service has been rendered to expectant mothers and infants when they were unable for various reasons to obtain medical service through other sources. This has unquestionably been a factor in reducing maternal and infant mortality rates. From an economic standpoint health supervision of the child has been demanded of health departments. This activity is not carried on alone by the official agencies but there is active participation by the medical profession."

"Changes in economic conditions in the country during the past several years have presented new perplexing problems to the medical profession. It can be stated without misstatement of facts that additional burdens have been placed on the medical profession in the care of the indigent sick. The care of the indigent sick may not be a function of the government, but it is a responsibility whether it be national, state or local. This service usually has been available only through the efforts of the practicing physician, who through his self sacrifice and humanitarian service cared for those unfortunates to his own detriment and loss."

At this time of expanding public health activity it is essential that public health and private practice advance with a united front, accepting additional opportunity for service

and preserving the basic rights of individuals. If there has unfortunately been any divergence of thought and interest, a changing social order makes it inevitable that in the future the two cannot possibly remain apart. The additional function and responsibility of the health departments can only be successfully undertaken with the help of the practicing physician. The care of the indigent sick is a responsibility which he cannot carry alone, and it is not his place to carry it without just compensation for his services. Further evidence of the necessary cooperative participation and interest of the practicing physician in the changing social scheme is evidenced in the platform of the American Medical Association, which advocates among other policies the following:

Item 1: The allotment of such funds as the Congress may make available to any state for the protection of health.

Item 4: The development of a mechanism for meeting the needs of expansion of preventive medical services with local determination of needs and local control of administration.

Item 5: The extension of medical care for the indigent and the medically indigent. (Note the differentiation that many nonindigent individuals are indigent so far as the ability to purchase medical attention is concerned.)

Item 8: Extension of public health and medical services consistent with the American system of democracy.

As has been previously stated the maternal welfare problem in North Carolina can only be solved after consideration of certain facts in our economic, social, and geographical structure. A highly successful program in a metropolitan center with its concentration of population, or an effective maternal and infancy service in a midwestern state with no racial problem, might be an utter failure in the southern states. Among these local characteristics might be mentioned:

1. A low per capita wealth—among the lowest in the nation—making it difficult for many people to obtain adequate medical care and producing a large number of medically indigent obstetrical patients, estimated at 50 per cent of the annual births.

2. A widely scattered rural and agricultural population, between 80 and 85 per cent of the population residing in communities of less than 10,000 population.

3. A midwife system delivering 30 per cent of the population under limited control and with inadequate supervision, and with no systematic and organized method of removing from their care the abnormal or potentially pathological case.

4. An inadequate or completely absent public health service in many counties and inadequate medical facilities in many others.

Thirty-five thousand mothers annually give birth to babies in North Carolina with inadequate medical care. The patients of midwives form the large nucleus of this group. The medical profession would certainly endorse any measure that would bring to their hands early in pregnancy the abnormal and potentially complicated cases, leaving only the most normal obstetrical case in the midwife's hands. The results in Moore County are worthy of mention. A trained nurse midwife from the Lobenstein Clinic has developed a program of supervision and teaching of midwives, with a regulation of midwife practice by medical aid that is applicable to every county of the state. Over 1000 consecutive deliveries have occurred in this county without a single maternal death, where a few years ago the maternal mortality rate was 16 per 1,000.

Public health nurses with supplementary training as midwife supervisors offer an economical solution, and may serve as liaison between the practicing physician and the public health department in their joint efforts to solve the maternal and infancy welfare problem of North Carolina.

Abstract of Discussion

Dr. Makepeace (University of Pennsylvania): Mr. Chairman, the problems which you men face in North Carolina are, of course, quite different from those which are faced in a large city, as Dr. Bradford has brought out. We have very few midwives. Most of our patients are delivered either in large clinics, or by home delivery services run by the medical schools, or by the private physician. As Dr. Bradford said, our problems can be solved in a way which would not apply down here.

I have recently discussed with Dr. Bradford his idea of public health nurses acting as supervisors of midwives. It seems to me that this would be an excellent method of attack, which would enable you to supervise people who otherwise would have no prenatal care and no delivery care or, at the best, very inadequate care.

Dr. R. A. Ross (Durham): I think this Section should be congratulated on this most provocative paper which we just heard. Dr. Bradford's figures will bear close scrutiny, and when you analyze them I am sure you will find that they are correct in every respect. He emphasizes the point which you folks are continually making—the necessity for reaching those patients in need of medical care. The problem is to get the patients to see somebody

who has their confidence. They are indifferent.

I recommend Dr. Bradford's paper to you for your careful consideration.

Dr. R. S. McGeachy (New Bern): I think that maternity and infancy care is one of the best pieces of work that we could possibly develop, but in my county I have not been able to develop any white patronage in the prenatal clinic. Although I hold separate clinics for white and colored women, no white patients have come to the clinic for prenatal care.

Dr. P. Y. Greene (Burlington): It is commonly said that the thing that causes the most maternal deaths is the fact that we don't get these patients early enough. In my experience in practice I found that if I saw a case early in pregnancy, the chances were that I would do less work in seeing her throughout the pregnancy than if I got her a few days before she was to be delivered.

I wish that doctors throughout the state would have one price for deliveries, whether they see the patients six weeks after they become pregnant or at the time they start in labor.

Every doctor should be a doctor in preventive medicine. I don't know of any field that is better than working with these mothers and with these children.

If the babies are brought back at monthly intervals you will see a number of cases of diarrhea and other diseases of childhood. We used to go so far as to send a card within the six months, reminding mothers to bring their babies for diphtheria vaccination. I would like to see general practitioners do more of that.

Although we have a large number of maternity centers in small communities, there are not enough people in those places to have a clinic, and it is largely the responsibility of the general practitioner.

Dr. E. S. Lunton (Raleigh): I would like to take this opportunity to say a few words of praise for Dr. Bradford. Dr. Bradford is the director of our maternity work in Charlotte, and I had the privilege of looking over a report of his work for 1939.

Last year in the City of Charlotte they had around 932 deliveries. Only about 23 per cent of those deliveries were done in a hospital. And out of those 932 patients, I think there were only four maternal deaths. That shows what we can do when we really go after a problem.

To get anywhere in our maternity and infancy work, we are going to have to recognize the factors in mortality that Dr. Bradford points out—that is, poverty, ignorance and neglect—and we as doctors will have to assume our share of responsibility for that neglect. If we don't do it, I think some other body may straighten us out. I hope they won't have to.

The Effect of Pregnancy on the Hemoglobin.—Pregnancy is invariably associated with some decrease in hemoglobin level. This occurs in part as a result of the physiologic increase of blood volume during the latter part of pregnancy with hydremia accounting for ten or twenty per cent dilution of the blood solids. However, the developing fetus requires its blood building pabulum and takes its apportionment of iron from the mother. In the case of a normal full term fetus, born with an average hemoglobin complement of 120 per cent (regardless of the status of its mother's iron store), this would represent a loss to the maternal supply of approximately 500 milligrams of iron, or the equivalent of one liter of blood.—Philip F. Eckman, M.D.: Indications for Use of Iron in Treatment of the Anemias, Minnesota Medicine, 23:713 (October) 1940.

ENDOMETRIOSIS

WALLACE B. BRADFORD, M. D.

CHARLOTTE

Endometriosis is a disease entity of the female pelvis which, because of our increased knowledge of its symptomatology and pathology, is now frequently recognized. However, in spite of the epochal work of Sampson[1] on this subject eighteen years ago, many practitioners lack a working knowledge of this disease. Various observers have noted its presence in from two to three per cent of the pelves exposed by laparotomy. It was first described by Rokitansky[2] in 1860.

Endometriosis may be broadly defined as the presence of endometrium outside of the uterine cavity. It may readily be subdivided into two types. The first type, internal endometriosis or adenomyosis, is an invasion of the myometrium by the endometrial elements, which may form circumscribed adenomas. These aberrent glandular structures are regulated and influenced by the hormones that control menstruation, and hence may be found in any stage of the menstrual cycle. The second and much more common type is external adenomyosis or endometriosis, which includes all the misplaced endometrium or adenomas that are situated outside of the uterine cavity or the myometrium.

The most frequent location of aberrant endometrium is in the ovary, and secondary deposits in the pelvis are often found. Other locations include the fallopian tubes, the broad ligament, round ligament, rectovaginal septum, urinary bladder, rectus muscle, umbilicus, liver, intestine, peritoneum, lung and the perineum. Beck[3] has reported a case of endometriosis simulating hernia into the canal of Nuck, and McLean[4] has noted that endometriosis should be constantly kept in mind when a tumor in the bowel wall is encountered or suspected in the female.

Read before the Section on Obstetrics and Gynecology of the Medical Society of the State of North Carolina, Pinehurst, May 15, 1940.

1. Sampson, J. A.: Perforating Hemorrhagic (Chocolate) Cysts of the Ovary, Arch. Surg. 3:245 (Sept.) 1921; Life History of Ovarian Hematomas, Am. J. Obst. and Gynec. 4:451 (Nov.) 1922.
2. Rokitansky, C.: Ueber Uterusdrusenbildung un Uterus, Zeitschr. der k. w. k. Gesellsch. de Artzte zu wein, 1860.
3. Beck, W. C.: Endometriomata on the Round Ligaments, Am. J. Surg 31:105. (Jan.) 1936.
4. McLean, N. J.: Endometriosis of the Large Bowel, Canad. M. A. J. 34:253 (Mar.) 1936.

Etiology

Henriksen[5] has summarized the theories of etiology under three heads:

1. Origin from normal endometrial tissue of the genital tract which might occur by:
   (a) Proliferation in continuity through the walls of the uterus and tubes. (Cullen[6], 1896)
   (b) Lymphogenous metastasis (Halban[7], 1924)
   (c) Propagation by retrograde menstruation (Sampson[1], 1921).
2. Origin from embryonic remnants in genital tract.
   (a) The wolffian ducts (Von Recklinhausen[8], 1895)
   (b) The mullerian ducts (Kossman[9], 1897)
3. Metaplasia of the serosal endothelium (Iwanoff[10], 1898, Meyer[11], 1924).

Sampson[1] in 1921 established endometriosis as a frequent pathologic entity and offered his theory of etiology based upon transtubal regurgitation of menstrual blood with viable endometrial fragments—this being most common with fibroids and retroversion. The regurgitant tubal flow has been noted at laparotomies by innumerable observers. Sampson has modified his views and agrees that his concept does not explain all cases, especially umbilical endometriosis.

Novak[12], Meyer[11], and others favor the metaplasia theory, the explanation of which is based on the embryology of the genital tract. I quote Novak[12] in the following: "The mucosa of most of the genital canal, as well as the germinal epithelium of the ovary, represents varying degrees of modification of the celomic epithelium, the primitive peritoneum. The germinal epithelium of the ovary is a segment of this tissue which is relatively undifferentiated, and therefore possesses a lot of unused differentiating potentiality. It shouldn't surprise therefore that sometimes areas may differentiate beyond that normal to the ovary, giving rise most frequently to endometrium. At times the abnormal areas may be identical with that of the tube, this being a recognized variety called endosalpingiosis."

Sampson[1] now accepts this metaplasia factor in a good many cases. It is hard to explain umbilical endometriosis except by metaplasia of serosal endothelium. Endometriosis of abdominal scars has long been thought due to trauma of the endometrium and secondary deposition of fragments. Most writers agree that the etiology is not always the same. Counseller[13] has called attention to the possibility of trauma to the pelvic organs at operation as an etiologic factor in pelvic endometriosis; for it is known that endometriomas occur in laparotomy wounds following uterine operations. In his series he found that over 50 per cent of the cases had had previous surgical treatment.

Pathology

Endometriosis simulates malignancy, and although histologically benign, is often clinically malignant in its ravaging behavior when untreated. The lesions are quite variable in size and appearance, ranging from small pink or blue-black spots on the surface of the ovary to large chocolate cysts. These cysts, or endometriomas, are usually no larger than hen eggs, but occasionally are many times larger. Almost invariably they are densely adherent to surrounding structures, especially to the posterior layer of the broad ligament and the cul-de-sac. Often numerous small blue puckered areas of implants are noted on the surfaces of the uterus, the utero-sacral ligaments, and throughout the cul-de-sac or rectovaginal septum. The proliferating and invading process may go on to freeze the pelvis completely and cause intestinal obstruction. Deep seated areas of endometriosis in the perineum, which are apt to become implanted in an episiotomy wound, may simulate an imbedded foreign body. In one of our cases the penetration and fibrosis of the process so invaded the broad ligament as to cause ureteral obstruction and hydronephrosis.

Microscopic examination reveals endome-

5. Henriksen, E.: Primary Endometriosis of the Urinary Bladder, J. A. M. A. 104:1401 (Apr. 20) 1935.
6. Cullen, T. S.: Adenomyoma Uteri Diffusum Benignum, Johns Hopkins Hosp. Rep. 6:133, 1896; Adenomyoma of the Round Ligament, Bull. Johns Hopkins Hosp. 7:112, 1896.
7. Halban, J.: Metastatic Hystero-Adenosis, Wien. klin. Wchnschr. 37:1205, 1924.
8. Von Recklinhausen, F.: Die Adenomyome und Cystadenomyome der Uterus und Tubenwandung, Berlin A. Hirschwald, 1896.
9. Kossman, R.: Origin of the Glandular Inclusions in the Adenomyomas of the Uterus and the Tubes, Arch. f. Gynak. 54:359, 1897.
10. Iwanoff, N. S.: Adenofibromyoma Cysticum Sarcomatodes Carcinomatosum. Monatschr. f. Geburtsh u. Gynak. 7:295, 1898.
11. Meyer, R.: Endometriosis, Arch. Gynec. 93:252, 1920.
12. Novak, E.: Pelvic Endometriosis and its Treatment, Am. J. Surg. 33:422 (Sept.) 1936.
13. Counseller, V. S.: Endometriosis, Am. J. Obst. and Gynec. 36:877 (Nov.) 1938.

trial tissue in the lesions, and this tissue frequently shows a typical response to hormonal stimulation. The glands may be empty or full of blood and debris, and are usually surrounded with stroma and round cell infiltration. The great pressure within endometrial cysts which is built up by menstrual activity month after month may eventually destroy the endometrial elements, which are replaced by connective tissue. Novak feels that the term "chocolate cyst" is very poor, and that they should be called endometrial cysts because of the fact that follicular and corpus luteum hematomas and ovarian cystadenomas often have chocolate colored contents. In the stroma and fibrous areas about the ectopic endometrial glands phagocytes filled with hemosiderin are frequently observed. Extensive fibrosis, adhesions and scar tissue formation are the rule, and perforation repeatedly occurring stimulates the development of new adhesions. The adhesions in the cul-de-sac and rectovaginal septum are often well nigh inseparable.

The disease occurs in both ovaries in about 30 per cent of the cases, and the pathology and symptomatology vary with the location and extent of the process. Frankel and Schenck[14] of Brooklyn, N. Y., have advanced an interesting but not conclusive hypothesis that all ectopic pregnancies, tubal or otherwise, occur because of nidation of the fertilized ovum in a locus of ectopic endometrial tissue to which the ovum is chemotactically attracted.

Diagnosis

The diagnosis is based on the history, symptomatology and findings. The disease is usually one of reproductive life, and Keene and Kimbrough[15] found 75 per cent of their patients to be between thirty and fifty years of age. A great difficulty in the preoperative diagnosis of endometriosis is the frequency of coexisting pelvic pathology such as fibromyomata, endocervicitis, salpingitis and ovarian lesions. The differential diagnosis must consider all pelvic lesions associated with bleeding and pain. A detailed history is most important for clinical diagnosis. A history of acquired dysmenorrhea and intermittant abdominal or pelvic pain which is worse premenstrually suggests endometriosis. Back pain is usually low, probably from swelling of the uterosacral ligaments; pain in the rectum and bladder and painful defecation with menses is often associated, and dyspareunia of the acquired type is frequently present. A history of sterility is probably obtained in half the cases, and menorrhagia or metrorrhagia or both are usually present. The symptoms are like chronic pelvic inflammatory disease, and their monthly periodicity is most important.

The findings likewise simulate chronic adnexal disease, and the pelvic organs may be firmly adherent on one or both sides. Nodular masses like buckshot which are exquisitely tender may be palpable in the uterosacral ligaments, cul-de-sac or rectovaginal septum. These nodules may at times be seen as bluish bulges under the vaginal mucosa in the fornix or rectovaginal septum. This clue may be absent, but when present, it is almost pathognomonic. The uterus is often in adherent retroversion, and the uterosacral ligaments are often tense, tender and firmly fixed. The white cell count and sedimentation rate, which are usually normal, may be of help in differentiating from pelvic inflammatory disease. Endometrial lesions have been wrongly diagnosed as carcinoma, and have, in fact, undergone carcinomatous change; however, this is a rarity. Occasionally patients with very large endometriomata will be found free of symptoms altogether. Often, however, because of pelvic adhesions the pain produced by examination is out of all proportion to the extent of growth felt, and in the absence of a history of pelvic inflammatory disease, a cystic tumor of the ovary that is very painful should lead one to suspect an endometrial cyst. One should remember that the physical findings may be so meager that the diagnosis must depend on intelligent and accurate history taking.

Endometriosis may cause pelvic pain and dysmenorrhea in young females, although the lesions may not be large and firm enough to palpate. Severe dysmenorrhea is probably due in many instances to adenomyosis.

Endometriosis of the bladder can be confused with carcinoma. However, the hematuria, dysuria, and pain are usually cyclical in character, and cystoscopic finding of the blue black cysts confirms the diagnosis. Tubal

14. Frankel, J. M. and Schenck, S. B.: Endometrial Theory of Ectopic Pregnancy, Am. J. Obst. and Gynec. 33:393, (Mar.) 1937.

15. Keene, F. E. and Kimbrough, R. A.: Endometriosis in Curtis: Obstetrics and Gynecology, Philadelphia, W. B. Saunders Co., 1939, p. 388; Endometriosis, J. A. M. A. 95:1164 (Oct. 18) 1930.

endometriosis has often been wrongly diagnosed as ectopic pregnancy.

Treatment

When the endocrinal influence is removed by menopause or other means the activity in this tissue ceases and retrogression occurs, because its growth and development depend on ovarian secretions. However, ovarian ablation is not indicated in all cases, for endometriosis is a disease of childbearing women, and conservatism is desired. Each case must be individualized in regard to treatment. Efforts should be made to save enough ovary to maintain fertility.

Small symptomless lesions noted at laparotomy for other pathology may frequently be snipped off without damage to any important organ. Obstructive symptoms necessitate resection, but it is rarely necessary to resect the bowel. A diagnosis of endometriosis justifies thorough removal of the affected tissue.

A young woman with unilateral ovarian involvement should have only one ovary removed; if there is recurrence she may have borne children in the meantime, and a more radical procedure after this is not so great a tragedy. I agree with Novak[12] that the surgeon should be influenced by the marital and social status of his patient as much as by the pathology. Counseller recommends presacral sympathectomy as an adjunct to conservative therapy in the young patient with marked dysmenorrhea. The preservation of the reproductive function should not be over emphasized, however; for about 50 per cent of married patients with this disease have been non-fertile. In older women nearing the menopause the same pathology would call for hysterectomy and bilateral oophorectomy. When there is extensive bilateral ovarian involvement and many implants, complete ovarian ablation is necessary and curative. Occasionally it is physically impossible to remove all ovarian tissue, so that the patient may not have menopausal symptoms after bilateral oophorectomy, and the process may continue. Castration dosage of x-ray will control nearly all of such cases.

The therapeutic value of irradiation depends on complete ovarian destruction, and this is too radical in many cases. The presence of numerous adhesions also may contraindicate x-ray therapy. Irradiation therapy, however, is most valuable in the presence of widespread pathology when the ovarian tissue cannot be totally removed, in poor operative risks, and in nearly all recurrences. Surgery is best, in the third and fourth decades, because one cannot determine clinically the necessity of complete ovarian ablation, and because pelvic pathology is frequently coexistent.

Case Reports

Case 1. Y. P., a twenty-six year old white woman who had had a spontaneous delivery with an episiotomy in 1932, complained of mild leukorrhea and a "stitch" at the vaginal introitus. She had a slightly tender and sensitive scar in the old episiotomy wound which swelled after her periods, but did not discharge.

Pelvic examination revealed a small, tender, bluish scarred area in the region of the previous episiotomy scar in the perineum, which we thought possibly was due to the presence of a foreign body. The cervix presented a stellate laceration.

An operation was performed in June, 1936. The cervix was dilated and a bilateral trachelorrhaphy and small posterior colporrhaphy were performed, with excision of the above mentioned area. On section, no foreign body was found, but a small drop of chocolate colored blood extruded, which was found to be an endometrial transplant.

Pathologic examination revealed typical endometrial glands, some surrounded by a little stroma. The stroma contained areas of hemorrhage, and the glands in a few areas contained hemorrhagic exudate.

Postoperative diagnosis: Endometriosis of the perineum. The patient made an uneventful convalescence.

Case 2. M. L. McK., a twenty-six year old white nullipara, complained of dysmenorrhea, which had increased in severity for the past three years. For the past two years it had been necessary for the patient to miss three days from work each month. She had not been relieved by syntropan and antuitrin, and recently narcotics had been necessary. The periods were regular and free. The patient was subject to a lower right sacral backache.

Pelvic examination revealed a nulliparous outlet and a clean cervix. There was rather marked descensus of the uterus and irregularities on the uterine surface, suggestive of myoma. However, on the basis of the symptomatology a preoperative diagnosis of en-

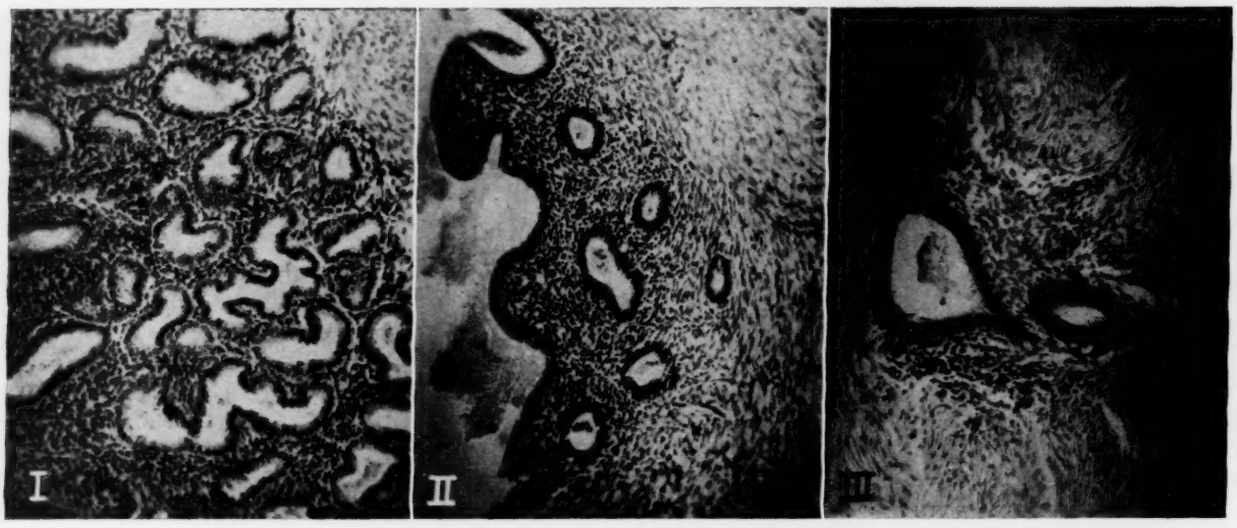

Fig. 1. Normal secretory endometrium.
Fig. 2. Ovarian endometriosis (Case 2).

Fig. 3. Abdominal wall endometriosis (Case 5).

dometriosis was made. An operation was performed after two months of conservative therapy.

On June 21, 1937, a bilateral salpingo-oophorectomy, an appendectomy and a modified Coffey suspension of the uterus were performed. Both ovaries were found to have been destroyed by densely adherrent endometriomata the size of lemons.

Pathologic examination of the ovarian tissue revealed bilateral ovarian endometriosis.

The patient made an uneventful postoperative recovery and was discharged from the hospital on the thirteenth day.

This patient has been carefully followed since operation. She has been able to return to work and has remained free of all symptoms except nervousness and occasional hot flashes, which were completely controlled by 5,000 I. U. of estrogenic hormone weekly. Since her ovarian ablation she has had two painless and apparently normal menstrual periods within a year. These, we felt, were due to the estrin administration.

Pelvic examination reveals a freely movable, small uterus, with no abnormalities palpable in either adnexal region.

Case 3. W. J. S., aged 32, a white woman, Para II, was examined for severe pain in the lower abdomen and right loin, accompanied by fever, chills and vomiting. She had been subject to intermittent attacks of lower abdominal pain for several years, frequently associated with her menstrual periods and necessitating several days' bed rest. She was previously supposed to have had a prolapsed right kidney. Her last pregnancy was nine years ago. Her periods had been regular and accompanied by dysmenorrhea which had increased in severity for the past several years.

At the time this patient was first seen she was acutely ill and toxemic, with a temperature of 101°, and a pulse of 120, and she was somewhat dehydrated. Her abdomen was rigid and tender in the right lower quadrant.

Pelvic examination was unsatisfactory due to the extreme rigidity and tenderness. The white cell count was 18,000. This patient was seen in consultation, and it was felt that peritonitis was definite and that the etiology might be appendiceal. A diagnostic laparotomy was performed on May 17, 1937. About 1,000 cc. of serosanguineous fluid was drained out of the peritoneal cavity. Bilateral fixed adherent ovarian masses the size of small oranges were found. An acute exudate covered all organs. Periappendicitis was present. A diagnosis of bilateral endometriomata and peritonitis was made, and the abdomen was closed because the patient's condition did not justify extensive surgery at that time. She made an uneventful convalescence and was discharged on the twelfth day.

Subsequent examinations of the patient revealed a right adnexal mass, about three times the normal size, which was tender and markedly fixed and did not respond to therapy. Menstrual periods continued very painful, with residual soreness in the right side between periods. In August, 1937, the patient was referred to Drs. McKay and McKay for urological examination.

A pyelogram revealed a right hydroureter

and hydronephrosis from a narrowing in the broad ligaments at the site of the pelvic mass. Surgery was advised, and a second operation with a ureteral catheter in place was performed on August 23, 1937.

At this time large, densely adherent, bilateral endometriomata were found, and the endometriosis was found to extend in between the layers of the right broad ligament around the area through which the ureteral catheter had been passed. There were many transplants between the sigmoid and the posterior uterine wall which were dense and friable.

A bilateral salpingo-oophorectomy was performed.

The patient made an uneventful convalescence and was discharged on the tenth day. Examination six months after operation revealed no abdominal masses, and cystoscopic drainage of the right kidney revealed only one-half ounce of residual urine. All symptoms had disappeared except mild menopausal nervousness, which was controlled by sedatives and occasional hormone injections. Two and a half years after operation the patient remains free of symptoms.

Case 4. J. B. S., aged forty-seven, a white nullipara, was examined for profuse vaginal bleeding of four days' duration. The menses had been very heavy for several years, recently occurring every three weeks and lasting one week. No dysmenorrhea was associated. The patient had had poliomyelitis fifteen years ago.

Examination revealed a blood pressure of 200/104 and a marked secondary anemia. A hard, sensitive pelvic tumor was palpable to the umbilicus. A small umbilical hernia was also present.

Pelvic examination revealed a firm, tender uterine tumor, which was irregular in outline. There was definite parametrial induration on the right side. The patient was given a transfusion preoperatively.

Preoperative diagnosis: Fibromyoma uteri, umbilical hernia, hypertension, and secondary anemia.

On April 7, 1937, a supravaginal hysterectomy and bilateral salpingo-oophorectomy were performed, with repair of the hernia after umbilectomy. A multinodular fibroid uterus with adhesions to the right ovary and tube was found. The right ovary was the site of extensive endometriosis, and a large tarry cyst was opened in extraction from the cul-de-sac. Numerous endometrial transplants were noted on the bladder flap. An endometrioma the size of a lemon deep in the cul-de-sac was left *in situ*. The left adnexa were negative.

The patient made an uneventful convalescence and was discharged on the fifteenth postoperative day. Follow-up examination six months later revealed a clean, pliable pelvis with no evidence of the endometrial cyst that was left deep in the cul-de-sac. Apparently it had been completely absorbed after the ovarian ablation.

Case 5. A twenty-four year old white nullipara, who had had a tumor removed from her womb and a uterine suspension in 1935, complained of soreness in the abdominal scar which was worse during menstrual period and for a few days afterward. This had been present since her previous operation, and was progressively getting worse. Recently the pain had been very severe. Periods were regular, but accompanied by dysmenorrhea of the acquired type, especially on the right side.

Abdominal examination revealed a healed midline scar, in the middle of which a hard mass was palpable and exquisitely tender to touch. There was no evidence of inflammation.

Pelvic examination revealed an acutely anteflexed and fixed uterus, with a hard tender indurated area connected with the posterior wall. The left ovary seemed enlarged.

Preoperative diagnosis: Endometriosis of the abdominal wall.

An operation was performed on September 19, 1938, and an endometriosis mass in the abdominal wall was excised and bilateral salpingo-oophorectomy was done. The densely adherent wall mass was about the size of a man's thumb and was lying between the fascia and peritoneum directly beneath the previous scar. The uterus was found to have been suspended. Both ovaries were densely adherent and were the sites of endometriosis, the endometrioma on the right being the size of a lemon, and on the left the size of an orange.

Postoperative diagnosis: Bilateral ovarian endometriomata and endometriosis of the abdominal wall. Miscroscopic examination of the tissue removed at operation confirmed these diagnoses.

The patient made an uneventful convalescence and was discharged from the hospital on the twelfth postoperative day. Follow-up examinations have found her com-

pletely relieved of all her distressing symptoms, and she is back at work.

Summary

Several cases of endometriosis are presented to emphasize again the varied pathology and symptomatology of the disease. These cases include perineal endometriosis following episiotomy, abdominal wall endometriosis after laparotomy, extensive pelvic endometriosis, and ureteral obstruction resulting from endometriosis. The physical findings, because of frequent coexisting pelvic pathology, are inconstant and often inconclusive as to diagnosis. The monthly periodicity of the symptoms and the acquired increasing type of dysmenorrhea are the most characteristic observations.

More care should be exercised at operations upon the uterus to prevent transplantations of endometrial fragments onto raw surfaces. Likewise the vagina and perineum should be protected as much as possible in the performance of curettage.

Conservative treatment is indicated in the young patient whenever possible in an effort to preserve the childbearing function. However, these cases bring out the fact that the pathology is frequently so widespread, even in the very young woman, that extensive pelvic surgery is necessary.

Abstract of Discussion

Dr. Ivan Proctor (Raleigh): Fifty to seventy-five per cent of patients with endometriosis are sterile, either acquired or absolute sterility. What produces this sterility? How much do these patients differ from the normal woman? Do they differ chemically or structurally? If they differ, does it prevent any implantation of the impregnated ovum, or does it encourage transplantation of the endometrium to some other organ? If it is transplanted to the ovary, what is the function of the ovary? Does it destroy the fertility of the immature or mature ovum?

We have always practiced tubal insufflation at the end of the post-menstrual phase of the cycle when the uterus and tubes are quiescent, for then we are more likely to get the true effect of patency.

A possible factor in regurgitation is the common practice of cauterizing the cervix. When the cervix is cauterized, stenosis of the cervix sometimes results. When this occurs, it is very easy for the obstruction from below to cause uterine contraction and to deposit the endometrium in the peritoneal cavity.

I want to emphasize the value of tube insufflation in the post-menstrual phase of the cycle, and the necessity for observation of the patient following cauterization to eliminate cervical stenosis.

Weariness without cause indicates disease.—Hippocrates.

THE BLOOD BANK

R. B. DAVIS, M.D., M.M.S., F.A.C.S.

GREENSBORO

Four or five years ago I visited the Massachusetts General Hospital in Boston, which is, as you already know, one of the oldest and largest hospitals in the world. They had just opened, a few weeks prior to my visit, a blood bank. With a small group of doctors, I was shown this blood bank outfit and had its operation explained to me in detail. The attendants were all apparently experts at the job they were trying to do. I recognized a great advance in serology, but the multiple details and amount of expenditure seemed immediately to place a barrier between this innovation and our small Southern hospital.

Last year while attending the annual meeting of the American College of Surgeons in New York, I was privileged to visit a special session set aside for the sole purpose of discussing blood banking. There were present laboratory experts from the Massachusetts General Hospital, the Philadelphia General Hospital and a number of the large New York hospitals. These people discussed the problem from every angle. The more they discussed it, the more discouraging it seemed to the representatives of small hospitals who were there.

However, largely through the efforts of our efficient Superintendent, Mrs. Mary Sanford, and with the advice of Dr. John Elliott, Director of laboratories at the Rowan and Cabarrus County Hospitals, the idea of blood banking was brought before the Board of the Piedmont Memorial Hospital in Greensboro. Immediately the barrier of expense and detail arose. However, after several meetings and considerable discussion, we finally decided to give the blood bank a trial.

The first and most expensive item, as far as we had been able to learn, was refrigeration. By taking stock of the cubic feet of all the refrigerators we had in the hospital, we found that it would be possible for us to set aside a part of one refrigerator sufficient to store four pints of each type of blood. This was a big hurdle to jump without any added cost.

The next item of expense was a centrifuge to precipitate the cells of the blood when it

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became a certain age and preserve the plasma. We were not able to use the centrifuge then in the laboratory. We learned, however, that even a centrifuge is not prohibitive in cost, and by making an expenditure of $179.95, we secured one of satisfactory size with four cups.

The next item was that of vacuum bottles and valves. The vacuum bottles were 85 cents each, and we secured two dozen for plasma and four dozen for whole blood. The valves were $12.50 each and we secured three of those, which have amply taken care of our needs. The other items of expense, such as tubings, needles, saline, etc., were not considered as extra items for the blood bank, because these things were necessary with the old method of transfusion.

Another item of expense was that of technical help. However, we were assured by Dr. Elliott that any well trained technician who was accustomed to doing intravenous puncture could take the blood with perfect safety and that we could teach the operating room supervisor and the superintendent the technique.

On September 7, 1939, we opened our blood bank. We gave publicity to it in the paper, and announced that the service of the blood bank was available to all hospitals and physicians in the community, the charge being $5.00 and 500 cc. of blood for deposit. Up to the present time, we have given one hundred and ten transfusions of whole blood and twenty-five of blood plasma for the following diseases and conditions:

(1) Pneumonia, (2) streptococcic and staphylococcic sore throat, (3) perinephritic abscess, (4) acute genito-urinary infection, (5) fibroid uterus with hemorrhage, (6) acute postpartum hemorrhage, (7) gun shot wound of chest, (8) streptococcic blood stream infection, (9) incomplete abortion, (10) ruptured gastric ulcer, (11) mastoiditis, (12) fractured leg with hemorrhage, (13) pyelitis, (14) abscess of abdominal wall, (15) secondary anemia, (16) postpartum anemia, (17) ruptured peptic ulcer with hemorrhage, (18) Malta fever, (19) pernicious anemia, (20) hemorrhage following cesarean section, (21) fractured femur with septicemia, (22) tuberculosis, (23) cancer of the sigmoid, (24) secondary anemia incident to pregnancy, (25) carbon monoxide poisoning (26) menorrhagia, (27) rheumatic fever, (28) functional vaginal bleeding, (29) empyema of the pleura, (30) empyema of the gall bladder, (31) postoperative hemorrhage, (32) chronic endometritis, (33) pelvic inflammatory disease, (34) ruptured hemorrhagic cyst of left ovary.

The average time required for a transfusion is about thirty minutes from the time the doctor walks into the hospital until the patient has received the blood. Of course, cross matching of the bank blood with the patient's blood must precede the transfusion, but the long wait for the donor and the numerous other necessary details are all dispensed with.

Every hospital is, of course, vitally concerned about the number and type of reactions they get from transfusions. Laboratory technicians and directors have assumed 95 per cent of the responsibility for these reactions, which are primarily due to giving mismatched blood.

Some of the members of our staff felt that there was a chance for contamination or confusion in a blood bank program. They said that labels might come off the bottles, or that blood might spoil or deteriorate microscopically and chemically before it did macroscopically, and that a serious reaction might take place. Others said that there was danger of giving blood from a syphilitic donor; however, since blood is always on hand in the bank to give the patient, there is time to obtain a report on each donor's blood. The fears of reactions have not materialized; for, with the 135 transfusions of whole blood and plasma that we have given, there have occurred only two reactions and neither of these was serious. As far as I am familiar with other smaller hositals, this has been practically their experience. However, reports in the literature from the larger hospitals bear out the belief that blood banking is a highly technical procedure, and that dangerous reactions will occur unless experts in this field and expensive equipment are employed.

In our hospital, the blood bank has been so satisfactory and of such convenience that we feel that the other small hospitals, in knowing of our success, might adopt this method. I would like to encourage all small hospitals to consider, and if possible to employ this method of giving blood transfusions. When the blood becomes too old—in five to seven days—it can be converted

into plasma, and this can be kept almost indefinitely. As Dr. Elliott[1] has shown, blood plasma is almost as useful as whole blood. It does not have to be matched, but can be given immediately with perfect safety to any patient.

In conclusion, let me state that a blood bank is no mystery. The cost is not prohibitive. Any laboratory technician who is worthy of the name can be trained and put in full charge of the blood bank with perfect safety to the patient. Reactions are not as much of a bugaboo in the small hospitals as the literature would lead you to believe they are in the large hospitals. Every hospital, regardless of the size, should consider a blood bank. Not only are they a great asset to the professional side of a hospital, but they bear a very nice profit.

1. Elliott, John; Tatum, Walter L.; and Nesset, N.: The Use of Plasma as a Substitute for Whole Blood, North Carolina Med. J. 1:283 (June) 1940.

Bleeding a Cause of Hemoglobin Deficiency.—To lose hemoglobin through blood loss is to lose iron. By simple calculation one can assume, theoretically at least, that a normal individual, having lost one-half of the blood in the body through acute hemorrhage, may restore the blood level to normal without receiving any iron from extraneous sources. This would be accomplished, of course, at the expense of the entire iron reserve; and the replenishment of the same would become the immediate physiological problem. More insidious depletion ensues as a result of chronic and recurring blood loss. The anemia-producing effect of daily bleeding from hemorrhoids and from gastro-intestinal malignancies is generally known. The commonest instance, however, is menstrual bleeding with its almost universal depression of hemoglobin values during this period of life. Minot states that the iron requirement in women during their menstrual life is four times that of men. It seems entirely consistent, therefore, that the severe tyes of hemoglobin deficiency, chlorosis and so-called idiopathic hypochromic anemia, occur almost exclusively in females.—Philip F. Eckman, M.D.: Indications for Use of Iron in Treatment of the Anemias, Minnesota Medicine, 23: 713 (October) 1940.

Iron in the Human Body.—Although minute traces of iron are known to be present in all tissue cells, the bulk of this element is contained in the circulating hemoglobin. It has been estimated that the normal adult human body contains an approximate total of four and one-half or five grams of functioning iron. Of this total, approximately ten per cent is tissue cell iron and sixty per cent is combined in hemoglobin. The remaining thirty per cent, about one and one-half gram in amount, is stored in available depots as the liver, marrow, spleen, to be used in the production of new hemoglobin as need arises. This then represents the so-called normal iron reserve.—Philip F. Eckman, M.D.: Indications for Use of Iron in Treatment of the Anemias, Minnesota Medicine, 23:712 (October) 1940.

THE NEW CONCEPTION OF ESSENTIAL HYPERTENSION

FRANK B. MARSH, M.D.

SALISBURY

Primary or essential hypertension is that type of hyperpiesia which has associated with it, at its inception, an increased arteriolar constriction, and later, degenerative changes in the vessels, for which there is no demonstrable cause. This definition obviously eliminates those cases of cardiovascular disease due to nephritis, hyperthyroidism, arteriosclerosis, or syphilis, although these conditions may be associated with the hypertensive state.

Essential hypertension may be benign or malignant, the distinction being based upon the speed of the development and the extent of the associated vascular, nephritic, ocular, and cardiac changes.

While essential hypertension has been recognized for many years and is known to occur in no small percentage of persons making up the average physician's practice, the mystery of its cause and mechanism of development remains unsolved. In fact, up until just a few years ago, it must be confessed, very little had been learned which could be considered a reasonable explanation for the increased vascular tension. In the attempt to arrive at a satisfactory theory as to the etiology of the disease, such factors as nervous or emotional disturbances, heredity, endocrine disorders, improper diet, and many other possible causes have had their proponents and supporters. The increase in blood pressure has been explained upon the basis of a reflex spasm of the peripheral arterioles.

There is no doubt that hypertension is due in certain instances to the psychoneurotic state[1], but the number of these cases constitutes only a small percentage of the total. Peet[2] believes that hypertension results from renal ischemia produced by vasoconstriction, which, in turn, is the result of a hyper-irritability of the sympathetic nervous system, hereditary in origin.

While it is held by some that the arteriolosclerosis associated with essential hyperten-

1. Waggoner, Raymond W.: Clinic "Anxiety Neurosis", University of Michigan Hospital, March 26, 1940.

2. Peet, Max M.: The Surgical Treatment of Hypertension, Internat. de chir., Vol. VI, No. 1 (Jan.-Feb.) 1940.

sion is due to the elevated blood pressure itself[3], there remains considerable doubt on that point. Up to this time, also, the cause of the arteriolar constriction which produces the hypertension has not been explained to the complete satisfaction of all those interested in the subject.

In 1934 Goldblatt and his co-workers began publishing the results of their very interesting experimental work regarding the etiology of hypertension. They have been able, by partially obstructing with a clamp the blood supply of one kidney, to produce a hypertension in dogs which was comparable to benign hypertension in man[4, 5, 6]. There was produced the elevation of the blood pressure without any abnormal urinary manifestations or any increased retention of nitrogenous material in the blood. There resulted, in the course of time, vascular changes in the blood vessels everywhere, except in the ischemic kidney and the eyes, these changes being characterized by some thickening of the media. The subsequent removal of the kidney thus treated brought about the restoration of the normal blood pressure in the animal.

When clamps were placed on the arteries supplying both kidneys, so that all kidney structure was made ischemic rather rapidly, there was developed a condition comparable to malignant hypertension seen in man. In this instance the albuminuria, hematuria, cylindruria, etc., made their appearance. There were also the retinal changes, the increased nitrogen retention in the blood and the subsequent death of the animal as a result of the uremia. The arterioles in many organs as well as in the kidneys of these animals showed a wide-spread fulminating arteriolar necrosis and necrotizing arteriolitis not distinguishable from that seen in man after death resulting from the malignant form of hypertension.

The question arose then as to the mechanism through which the hypertension was produced. Was it due to an internal secretion produced in the ischemic kidney which could raise the blood pressure in an effort to overcome the decreased blood supply to the organ? Was it the result of a nerve reflex which was initiated in the course of the experiment? Or, was it the result of retained urinary poisons which the ischemic kidney was failing to eliminate as it would under normal circumstances? It was easy to eliminate the last one of the possibilities, for when both kidneys were removed the blood pressure of the dog did not rise.

In order to disprove the possibility of the hypertension's being the result of any nervous reflex, the kidney or kidneys were completely denervated and the experiments repeated. As in the first experiments the animals with the denervated kidneys developed hypertension.

The work up to this point seemed to indicate pretty conclusively that there was produced in the kidneys thus made ischemic, a substance of pressor character which caused the hypertension.

In order to substantiate this theory several other experiments were done. After the renal artery was partially obstructed and the renal vein was tied off, no hypertension resulted. The theoretical secretion was thus prevented from gaining entrance into the systemic circulation.

When the kidney was made ischemic and the ureter of the same side was ligated, the hypertension failed to occur, as the kidney substance was soon destroyed by the pressure of the retained urine. It is interesting, too, to note that after the removal of the suprarenals, no hypertension resulted when the ischemia of the kidneys was produced. This fact indicates that it is through the suprarenal glands that the pressor substances function.

On the basis of these experiments Goldblatt and his co-workers have concluded that in those persons who develop essential hypertension there exists some mechanism which brings about a retarded flow of blood through the kidney vessels. The ischemia thus produced results in the generation of a humoral substance which brings about a generalized peripheral arteriolar constriction with the rise of the blood pressure. As a result of the rise of blood pressure and the development of azotemia the degenerative vascular changes are brought about.

Taquini[7] concludes from his experimental work on dogs: (1) That the arterial pressure rises after the reestablishment of the circulation to a previously totally ischemic kidney; (2) that the rise in the blood pres-

3. Reference taken from the Harvey Lectures, 1937-38, by Dr H. Goldblatt.
4. Goldblatt, H.: Studies on Experimental Hypertension, Ann. Int. Med. 11:69, 1937.
5. Goldblatt, H.: Experimental Hypertension Induced by Renal Ischemia, The Harvey Lectures, 1937-38, p. 237.
6. Goldblatt, H.: Studies on Experimental Hypertension, XII, Am. J. Clin. Path. 10:40, (Jan.) 1940.
7. Taquini, Alberto C.: The Production of a Pressor Substance by the Totally Ischemic Kidney, Am. Heart J., Vol. 19, No. 5, (May) 1940.

sure is the result of a pressor substance formed in the kidney during the period of total ischemia; (3) that the hypertension produced is the result of the pressor substance acting directly upon the peripheral vessels, producing a marked vasoconstriction.

It is difficult, of course, to transfer all of these established facts to the human being. However, a very significant fact is that in a large number of autopsies done on persons dying of hypertension, there was found in 86 per cent of the cases some evidence of reduced vascular supply to the kidney; or, in other words, a condition was found which was capable of producing some degree of ischemia of the kidney[8].

The two cases reported by Dicker[9] throw considerable light on the question of the etiology of hypertension. The first was that of a female, aged thirty, who because of an intoxication of unknown character developed anuria with marked nonprotein nitrogen retention, but without elevation of blood pressure. The investigation of the peripheral vessels of the patient revealed that they were reacting normally. The second was that of a female, aged twenty-eight, who, following scarlet fever, developed a marked hypertension without there being any increase in the nonprotein nitrogen or other evidence of renal insufficiency. There was found on investigation a marked degree of vasoconstriction of the peripheral and presumably the renal vessels. He concluded that the impairment or cessation of renal excretory function is not the cause of hypertension in kidney disease, but that vasoconstriction of the renal vessels, even in the absence of azotemia, is sufficient to cause and maintain the elevation of the blood pressure.

Another group of diseases which have a bearing on hypertension has recently been called to the attention of the profession. This is the group of kidney diseases which have associated with them a hypertensive state. Williams and Harrison[10], discussing the clinical pictures of 100 patients with increased blood pressure, stated that they found that 30 of those patients had evidence pointing to some type of kidney disease, either at the time of the examination or in the past. Of this number 8 had urinary tract obstruction, 8 gave a history of stone, colic, or hematuria, 5 gave a typical history of pyelitis, 8 presented a "masked pyelonephritis", and one had coarctation of the aorta. These observations regarding the occurrence of renal disorders in patients with essential hypertension are in accord with the conclusions of Schroeder and Steele[11], who found that a large percentage of patients afflicted with hypertension had abnormal pyelograms.

Several cases of unilateral kidney disease occurring in children[12, 13] and adults[14, 15] and associated with hypertension have been reported, in which the elevated pressure has been restored to normal following the removal of the diseased kidney.

Just what the mechanism of the hypertension is in these cases one can not say with any degree of certainty, but it is quite possible that these pathological processes might bring about, or in some way be associated with, a decrease in the blood supply to the kidney[16]. Such an occurrence could be explained by the Goldblatt theory of renal ischemia.

Bearing in mind the percentage of the hypertensive group who at autopsy manifested an organic lesion capable of producing some degree of ischemia of the kidney, and comparing this with the percentage of the successful results following operations on the autonomic nervous system, one obtains further insight into the etiology of essential hypertension. As suggested by Nesbit[17], one might infer from these figures that in a large percentage of the cases of this type of hypertension there is a renal ischemia which may result from some mechanical interference with the blood supply to the kidney. Such a condition could not be influenced to any great extent by any

8. Blackman, S. S., Jr.: Arteriosclerosis and Partial Obstruction of the Main Renal Arteries in Association With Essential Hypertension in Man, Bull. Johns Hopkins Hospital, 65:353, 1939.
9. Dicker, E.: Pathogenesis of Arterial Hypertension, Am. J. Med. Sc., Vol. 199, No. 5, (May) 1940.
10. Williams, J. R., and Harrison, T. R.: Clinical Pictures Associated with Increased Blood Pressure. A Study of 100 Patients, Ann. Int. Med. 13:650, (October) 1939.
11. Schroeder, H. A., and Steele, J. M.: Abnormalities of the Urinary Tract in Essential Hypertension, Proc. Soc. Exper. Biol. and Med. 39:107, 1938.
12. Butler, A. M.: Chronic Pyelonephritis and Arterial Hypertension, J. Clin. Investigation, 16:889, 1937.
13. Leadbetter, W. F., and Burkland, Carl E.: Hypertension and Unilateral Renal Disease (Child), J. Urol. 39:611 (May) 1938.
14. Barker, N. W., and Waltman, W.: Hypertension Associated With Unilateral Chronic Atrophic Pyelonephritis; Treatment by Nephrectomy, Proc. Staff Meet. Mayo Clinic, 13:118, 1938.
15. Boyd, C. Holmes, and Lewis, Lloyd G.: Nephrectomy for Arterial Hypertension, Prelim. Report, J. Urol. 39:627 (May) 1938.
16. McMillan, Thomas M.: Etiological Factors of Hypertensive Cardiovascular Disease, Lecture, Fifth Annual Post-Graduate Institute, Phila. County Med. Soc., Apr. 15, 1940.
17. Nesbit, Reed M.: Hypertension Resulting From Unilateral Kidney Disease, A. C. P. Post-Graduate Course, University of Michigan, Ann Arbor, Mich., March 29, 1940.

operation on the sympathetic or parasympathetic system. These cases, therefore, constitute the surgical failures. In the remainder of the cases there is a renal (and most likely a general) vasoconstriction, probably of nervous origin, which produces the elevation of the pressure. In these instances the operation on the autonomic nervous system is followed by a permanent reduction in the blood pressure. This group constitutes the operative successes.

While these changing views as to the possible etiology of essential hypertension are of significant importance, they are being accompanied by even as great a change in our concept regarding the treatment of the hypertensive state. One of the most discouraging things in the practice of medicine is the utter hopelessness with which the patient afflicted with this disease must be looked upon. No form of medical treatment, of which there have been and are many, has ever cured, checked, or apparently altered to any appreciable degree the progression of the disease. Essential hypertension has continued to exact its toll of human life year in and year out, either in the slowly developing benign form, the course of which extends over many years, or in the more rapidly fulminating malignant form, which results in the death of the patient within two or three years from its onset.

Is it too much to hope that a more effective treatment may be devised that will offer some hope of assistance to these unfortunate individuals? The fact is, as you know, that for the past several years surgical procedures have been suggested and employed as a means of relieving the hypertension and other symptoms of essential hyperpiesis. It is beyond hope, of course, that all cases manifesting an elevated blood pressure will be amenable to surgical treatment, but the fact that even a few may derive benefit warrants the careful consideration of all the facts involved as early after the inception of the symptoms as possible. In this way the patient may be given the opportunity, however small the chance for complete recovery may be, to benefit by operation and to avoid the disastrous consequences otherwise certain to follow.

These newer conceptions of etiology also emphasize the fact that in all cases of hypertension a thorough urological study of the case should be and must be made to determine whether surgery on the urinary tract could possibly offer any hope of relieving the disease.

Schroeder and Fish[18] conclude from their study that the number of cases in this group that can be helped is small. Only 2 out of their total of 7 cases were considerably improved by the operation. They suggest the following criteria for the selection of those cases suitable for this type of treatment:

1. The hypertension should not have existed more than two years.
2. The diseased process should be limited to one kidney, but the kidney involved should manifest a diminution of function.
3. The combined functional activity of the kidneys in regard to urine concentration and urea clearance should be within normal limits.
4. Neither retinitis nor much change in the caliber of the retinal vessels should be present.
5. Hypertension must be a persistent feature of the disease.

These criteria were met in only one case in their series, a fact which may explain the large number of their failures.

Nesbit[17], however, is more encouraging in his report. He states that in a series of 14 cases of unilateral kidney disease showing hypertension, 3 have manifested a return of the pressure to normal following operation and 6 others have shown a very definite improvement. The criteria for operation in his series were not stated.

Excluding nephrectomy and other kidney operations done in case of unilateral urological disease, the operations suggested and performed for the relief of hypertension involve the excision of thoracic and lumbar ganglia, the sectioning of the splanchnic nerves, the resection of the celiac ganglia, and the removal of a part of one or both suprarenal glands. Irrespective of the type of nerve operation employed, the purpose of surgery in these cases is the reduction of the level of the blood pressure, either by increasing the extent of the vascular bed, or, as Goldblatt suggests, by relieving, to some degree, the arteriolar constriction and thus producing a freer flow of blood through the kidneys.

The observation of Blalock, Levy, and Cressman[19] that unilateral renal ischemia

18. Schroeder, H. A., and Fish, G. W., III: The Effect of Nephrectomy Upon Hypertension Associated With Organic Renal Disease, Am. J. Med., Vol. 199, No. 5, (May) 1940.

19. Blalock, Levy, and Cressman: Experimental Hypertension: The effects of unilateral renal ischemia combined with intestinal ischemia on the arterial blood pressure, J. Exper. Med. 69:833, (June) 1939.

superimposed upon intestinal ischemia is productive of prolonged elevation of blood pressure may be significant in this connection. Such operations should tend to relieve ischemia of both the kidneys and the intestinal tract.

The credit for the idea of resecting the splanchnic nerves in the treatment of hypertension must be given to Danielo-polu, who in 1923 first suggested the operation for that purpose. A similar surgical procedure was suggested by Bruening and Stahl in the same year. In 1924 it was proposed before the Congress of Internal Medicine at Milan, by Pende, that the resection of the left splanchnic nerve be employed in the treatment of certain cases of arterial hypertension. Since that time there have been various operations and combinations of procedures advocated and employed in the surgical treatment of the disease. In 1925 Adson performed bilateral lumbar sympathetic ganglionectomy and trunk resection, including the second, third, and fourth ganglia on both sides, on a case of malignant hypertension. There was some symptomatic relief, but there was no material drop in the blood pressure. In the same year Adson carried out unilateral cervicothoracic sympathetic ganglionectomy and trunk resection in a boy eleven years of age who was suffering from the same type of hypertension. In 1932 Craige introduced an operation which included a section of the major and lesser splanchnic nerves below the diaphragm and the division of the sympathetic trunk between the twelfth dorsal and the first lumbar sympathetic ganglia[20]. Suffice it to say, without further detail as to operation, Walters, Crile, DeCourcy, Peet and others have each devised procedures and have used them in the treatment of essential hypertension. It seems that irrespective of the type of operation employed the percentage of successful results is about the same among all operators. The criteria on which the success of the operation is based are: (1) complete disappearance of the symptoms; (2) a drop of 40 mm. or more of mercury in the systolic pressure and a decrease of 25 mm. or more in the diastolic pressure, the fall in pressure being maintained.

The chart below presents the number of cases operated on, the results obtained, and the type of operations used by several surgeons who are particularly interested in the subject.

It is obvious that the proper selection of cases will determine to a significant extent the success to be expected from operation. Many patients afflicted with hypertension have arteries which are so inelastic or sclerotic that no possible benefit could be expected from surgery. So too, a patient who is suffering with nephritis, cardiac decompensation, or other complicating factors is not a suitable subject for the procedure. The selection of cases for operation is based upon the following criteria[16]:

1. The patient's age must not be over fifty years.
2. Renal function must not be greatly impaired. The nonprotein nitrogen should not be above 40 mg. per 100 cc. of blood. There must not be a marked

Surgeon	*No. Cases*	*Complete Cures*	*Worth-While Drop in B. P.*	*Slight Improv.*	*No Improv.*	*Mortality*	*Operation*
Crile, G. W.[21]	275*	17%	27%	21%	35%	.62%	Celiac Ganglionectomy
De Courcy, J. L.[22]	38**	28%	25%	32%	15%	0	Subtotal Unilateral Adrenalectomy
Peet, Max[2]	375***	15%	48%	16%	8%	3.8%	Supradiaphragmatic Bilateral Resection Greater, Lesser, and Least Splanchnic Nerves
		Good	*Fair*	*Temporary*	*Failure*		
Adson, A. W.[23]	237****	24%	28%	28%	20%	0	Subdiaphragmatic Sympathetic Denervation

* This number represents only the group of patients upon whom the celiac ganglionectomy has been done.

** This number represents only the group of patients upon whom the unilateral subtotal adrenalectomy has been done.

*** This number represents the group of patients operated upon to August 1938.

**** We were unable to obtain the results of operations according to the criteria given above, so the results are recorded as given in reference 23.

20. Historical data obtained from article by Adson, A. W., Winchell, McK. Craig, and Brown, George E.: Surgery in Its Relation to Hypertension, Surg. Gyn. and Obst. Vol. 62, No. 2 A (Feb.) 1936.

21. Crile, Geo. W.: Answer to Questionnaire, June 3, 1940.

22. De Courcy, J. L.: Answer to Questionnaire, June 3, 1940.

23. Craig, Winchell McK., and Adson, Alfred W.: Hypertension and Subdiaphragmatic Sympathetic Denervation, Surg. Clinics of N. A., Aug. 1939, Mayo Clinic Number.

decrease in the power of water concentration, or in urea clearance, and no marked abnormal urinary findings should be present.

3. There must be a definite response to the cold pressor test and a marked drop in blood pressure under sedation.
4. The state of the heart muscle should be good. Compensation must be intact.
5. Best results are expected when the symptoms are still mild, the disease has not been present over a very long time, and the blood pressure is quite labile.

While the results being obtained by surgery are not as yet spectacular we may at least hope that, with an increase in knowledge and experience, a much greater number of the hypertensive patients soon may be able to obtain relief from their disease.

Summary

1. The Goldblatt theory of renal ischemia as the cause of essential hypertension is outlined. The practical application of the theory is discussed, considering the post mortem findings in cases of essential hypertension, and the various types of kidney pathology associated with hyperpiesia.
2. The results of unilateral nephrectomy in hypertension are stated.
3. A brief historical sketch of the development of the operative procedures designed for the relief of essential hypertension is given. The results of the various operations now most widely employed for the relief of this condition by some of the foremost surgeons working in this field are briefly tabulated.
4. The early and careful study of all cases of essential hypertension is urged. Inasmuch as medical treatment is futile, many of these patients may be relieved surgically if the proper conditions exist and operation is done early.

The Essence of the Scientific Method.—The popular conception of a scientist as a man who works in a laboratory and who uses instruments of precision is as inaccurate as it is superficial, for a scientist is known, not by his technical processes, but by his intellectual processes; and the essence of the scientific method of thought is that it proceeds in an orderly manner toward the establishment of a truth.—Peabody, Francis W.: Doctor and Patient, New York, The Macmillan Company, 1939.

IT MAY BE HELMINTHS

CANDLER A. WILLIS, M.D.

CANDLER

The subject of helminths is, in my opinion, one of utmost importance. I am convinced that a routine stool examination is just as important as a routine urinalysis, although more difficult.

There is a large variety of intestinal parasites. To discuss parasitology in such a short time would be impossible, even if I were capable of doing it. For this reason, and because of my limited experience, I will discuss only four parasites, using the layman's terminology. They are hook worms, round worms, tape worms, and seat or pin worms. I have not tried to differentiate the types of hook worms and tape worms.

Shortly after hanging out my shingle in Candler, I found that a large percentage of my patients were infected with hook or round worms, or both. For this reason I have made it a practice to examine stool specimens from the majority of children treated, regardless of symptoms, and from all adults with indicative symptoms. Following this procedure, I have examined the stools of 400 patients. It seems almost incredible that of this number only 9 have been negative. Some of the patients have had more than one type of infestation. About one-half have had round worms; approximately one half have had hook worms. Some forty have had both. Fifteen cases of pin worms have been found, without doing rectal scrapings. There have been two patients infested with tapeworm.

At first a complete blood count was done on all infested patients, and always showed a moderate anemia with a color index below one. Frequently the differential white cell count showed an eosinophilia, but this was not always present.

Among children with parasites, the most common symptoms, as described by the mother, are that "the child gets pale around the mouth, picks its nose, and wants to eat dirt." The following symptoms have also been relieved by anthelmintic therapy: Bizarre appetites, expressed, as a rule, by a very poor appetite or a desire for sweets, although occasionally a ravenous appetite in

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Read before the Tenth District Medical Society, Marshall, N. C., May 22, 1940.

an undernourished child is found; vague and shifting abdominal pains, which are not suggestive of disease of any specific abdominal organ. Occasionally there is an exception to this, and the symptoms will indicate appendicitis. When this is the case, it is, of course necessary to proceed with the utmost care. In a few cases a stubborn bronchitis was not cleared up until after anthelmintic therapy. Sluggish mental reactions, lassitude, nervousness, or "fidgets", as the mothers frequently say, may be due to helminths. Convulsions have failed to recur in 3 cases after anthelmintic therapy. One of these patients also had a high fever with follicular tonsillitis, which was the probable cause of the convulsion.

In adults the symptoms differ little from those of children. I would like to stress the fact that frequently patients with symptoms suggestive of an abdominal neurosis have been found to have helminths; however, not all these patients have been relieved by anthelmintic therapy.

On physical examination a pale, ill-nourished, nervous individual is often found. In children the abdomen is usually distended—"pot bellied" is really much more expressive. A "doughy" feel is often encountered in the abdomen of a heavily infested patient. As a rule, after I have completed the history and physical examination, I feel that I am dealing with a sick person who presents very little for observation.

The diagnosis is made by patient and careful search for the ova or parasites in the stool. It is frequently necessary to study several slides under the microscope before finding them.

In medical school we learned that one treatment of an adequate quantity of oil of chenopodium or caprokol would remove 90 per cent of round worms or hook worms, and that two treatments would effect a cure. Experience shows three to five treatments—usually five—are necessary to produce negative stools. For the most part one or two doses will diminish or abolish the symptoms, but if the stools are still positive the symptoms frequently will return. This is unfortunate, for it is against human nature to continue disagreeable treatments after the symptoms have disappeared. I have used tetrachlorethylene in a few cases and intend to give it a thorough trial, for in these the results have been satisfactory. As yet I have had no experience with the other anthelmintics for hook worms and round worms.

In treating pin worms my results have been satisfactory, though the literature states that they are difficult to eliminate. To obtain a cure it is necessary to take advantage of the life cycle of the pin worm. As you know, the eggs and an irritant are deposited around the rectum by the female. The irritant causes the patient to scratch and thereby eggs are deposited under the finger nails. If the hands are then placed in the mouth, the cycle is complete, as these parasites do not need an intermediate host. These patients are advised as follows: To wash the rectum thoroughly, not less than three times a day with soap and water; to wear gloves, or tie the hands so the rectum cannot be reached, especially at night. An anesthetic ointment — nupercaine, for example—is applied to prevent itching. By mouth caprokol is given as follows: .1 Gm. per year of age up to ten years, repeated every five to seven days for four or five doses.

The following treatment for tapeworms was used once with a good result: A high calcium diet was administered for ten days. No meat was allowed for three days preceding therapy. On the preceding evening a light meal was given and a saline purge at bedtime. No breakfast was allowed on the following morning. One or two ounces of magnesium sulphate were given in half a glass of water, with 3 cc. of carbon tetrachloride (for children, .2 cc. for each year of age). The patient should remain in bed for twenty-four hours, and calcium gluconate should be on hand for use if toxic symptoms, especially severe vomiting, should occur. Carbon tetrachloride is not to be given with alcohol or fats, and is contraindicated in the presence of hepatic damage. It is necessary to treat the patient for round worms first if they are present.

The following case reports are illustrative.

The patient that started my interest in this subject came to me on August 15, 1938, complaining of pain over her kidneys and sides of four months' duration. She had the symptoms, and the physical and laboratory findings of acute nephritis. From the history and physical examination no focus of infection was found. A 9 per cent eosinophilia was found on making a differential blood count. A stool examination was positive for hookworms. The patient was treated

conservatively for ten days without improvement. I felt that caprokol would not further injure her kidneys, and gave her two treatments at ten-day intervals. She began to improve after the first treatment, and improvement continued for six weeks, at which time recovery seemed to be complete. The physical examination and urinalysis were negative. Her health has been perfect since.

The second case is one that has caused me considerable embarrassment. From the physical examination and history I felt sure that the patient had Meniere's syndrome. I gave her large doses of ammonium chloride, with a low salt diet. She remained symptom free for three months. Because she had not experienced such relief for three years I felt that I was correct in my diagnosis and had produced a cure; therefore, when I was asked to give a case report at the Buncombe County Medical Society, I decided to present this one. The day after the *Bulletin* came out stating that I would present a case of Meniere's syndrome, the patient had the worst attack of her life, with extreme nausea and dizziness, and profuse vomiting. A gastric analysis was repeated, and hookworms were found in the material from her stomach. Both hookworms and round worms were present in her stool. She was given four treatments with oil of chenopodium. Since then she has had only an occasional, very mild attack of dizziness without the other symptoms, and states that she has never felt better.

Case 3. A young man of twenty-eight years came to me on January 22, 1939, with a chief complaint of pain in the left upper quadrant and belching up food. He had had these symptoms for eight years, and in an effort to obtain relief he had undergone a tonsillectomy, an appendectomy, and a laparotomy, and several x-ray diagnostic procedures. From the history and physical examination my impression was that of a gastric neurosis. A stool examination was positive for round worms. Three treatments with caprokol relieved his symptoms, but numerous treatments have failed to obtain a negative stool. Occasionally he feels a recurrence of symptoms and repeats his treatment. Why his stools remain positive I don't know.

Case 4. Last December a small, undernourished, pale boy of eight years was brought to the office, with the history that he would not eat, and that he caught one cold after another. Physical examination revealed a pair of badly diseased tonsils, which are to be removed shortly. A stool examination was positive for round worms. Two treatments with oil of chenopodium were given. I saw this boy three weeks ago. He was a transformed child—strong, ruddy, and full of energy. His parents stated that he was eating heartily. Several similar cases have been treated. I have had to give tonics to only three or four children in an effort to increase their appetites. In all other cases anthelmintic therapy has done the trick.

Case 5. About one year ago I saw a twenty-six year old man in my office who was having violent convulsions. I could not determine the cause in spite of as careful a history and as thorough a physical examination as could be done. In the hospital complete laboratory work did not help to clear up the diagnosis. On the third hospital day, while the patient was having another convulsion a large round worm was expelled. The diagnosis was clear. Anthelmintic therapy was given. The patient has been healthy since.

I hope the title of my paper is now clear, and that other physicians will become as interested in the subject as I have been. This is a public health problem as well as a problem for every individual doctor.

DRY ICE TREATMENT FOR HICCOUGH

M. A. PITTMAN, M.D.
WILSON

The old household remedy of holding a paper bag over the mouth and nose and having the patient breathe in the bag for several minutes has long been used for hiccough. A modification of this remedy makes use of carbon dioxide snow (dry ice), obtainable at any modern drug store or ice cream plant, and water. The procedure is simple: Take a ten-pound paper bag, turn the edges of the bag down, place a four-inch square of dry ice (ten cents worth) and two ounces of water in the bag. Have the patient breathe into the bag for several minutes until the hiccoughing stops. Trials of this remedy at the Woodard-Herring Hospital, Wilson, N. C., have given excellent results.

The tuberculosis disease rate of medical and nursing personnel in modern tuberculosis sanatoria is generally lower than in hospitals not having a properly supervised tuberculosis department.—B. H. Wardrip, Hosp. Management, Dec., 1939.

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NOVEMBER, 1940

POSTGRADUATE EDUCATION

The problem of postgraduate medical education is a perennial one, and no thoroughly satisfactory answer has been evolved. Various solutions have been attempted, such as local clinics, University extension teaching and large symposiums. All of these do some good, no doubt, but none reaches the large body of the profession.

The ideal method probably would be for the practicing physician to return to his own, or to some other medical school for six months' intensive work every few years. Two considerations make this suggestion impracticable. In the first place, such a plan is not economically or professionally possible for the great bulk of practicing physicians; and, secondly, the medical schools are not organized to teach such large numbers of postgraduate students.

The belief is growing among students of this problem that the only really effective postgraduate education is that given to house officers in our hospitals immediately following their graduation. It is in the highest degree probable that if every medical graduate received at least two years of intensive training in hospitals before entering practice, the need for "brush-up courses" would rapidly decline. Too many physicians in the past have entered practice ill-equipped to keep abreast of the rapid current of medical progress, with the sad result that many have stranded on the shoals and in the backwaters of medicine. The future, even more than the past, belongs to the well-equipped physician, for at last the public shows evidences of an interest in good medical practice which may culminate in a less ignorant attitude toward practitioners of medicine.

The good physician must be a life-long student. He should subscribe to and read the current medical literature; he should keep his library modern by the purchase of well-considered books; he should be wary of the plausible book agent. If all physicians were keen students of medicine, the local medical society would be the best place for postgraduate training.

* * * *

A WELL DESERVED TRIBUTE

On Friday afternoon, October 11, a portrait of Dr. Isaac H. Manning was unveiled in the Library of the Medical School of the University of North Carolina. Most fittingly the ceremony came at the conclusion of the Regional Meeting of the American College of Physicians, of which Dr. Manning is an honored member. The presentation was made by one of Dr. Manning's former pupils, Dr. W. Raney Stanford, and the portrait was accepted on behalf of the University by President Frank Graham.

Dr. Manning probably is known by more North Carolina doctors than any other doctor in the state. His long service as Dean of the University medical school and as one of its teachers brought him into close contact with a great many of the practitioners in the state. His year as president of the state medical society, followed by his selection as head of the Hospital Saving Association, made him known to most of the other members of the North Carolina profession. His rugged honesty, his fairness, his good judgment, his ability, and his loyalty to friends endear him to those who know him, and made the opportunity of contributing to the portrait fund a real privilege. The painting is an excellent one, and will be a lasting reminder of Dr. Manning's great service to the University and to the state; but his legion of friends hope that the flesh and blood original will long continue to grace the University halls and campus, as well as medical gatherings, for many years to come.

THE LOCAL USE OF SULFAMIDO COMPOUNDS

The NORTH CAROLINA MEDICAL JOURNAL is rather proud to publish this month the excellent paper by Dr. J. A. Sinclair, a dentist of Asheville, on the local use of sulfanilamide. The pioneer nature of Dr. Sinclair's work and the timeliness of his paper are evidenced by the fact that the *Proceedings* of the Staff Meetings of the Mayo Clinic for September 25, 1940, contains two articles [1, 2] on this subject. Both corroborate Dr. Sinclair's observations as to the value of sulfanilamide used locally. The first article deals with the use of a saturated solution (.08 per cent) of sulfanilamide in normal saline solution for the irrigation of wounds following resection of the rectum for carcinoma. The sulfanilamide solution was prepared "by heating a physiologic solution of sodium chloride to the boiling point and adding sufficient sulfanilamide to make a saturated solution." Mayo and Miller[1] found that flushing the cavity with hydrogen peroxide preliminary to irrigating with the sulfanilamide solution apparently increased the bactericidal action of the sulfanilamide.

The use of the hydrogen peroxide is based upon the theory of Shaffer that the sulfamido compounds owe their therapeutic effects "to oxidation products of these substances formed by atmospheric oxygen under the catalytic influence of respiring tissues or organisms."

Mayo and Miller conclude: "It is our feeling that the growth of connective tissue is stimulated to some extent by the administration of sulfanilamide. Irrigations with this chemical compound have been effective when other drugs have failed and it is therefore recommended as another agent in the therapeutic armamentarium."

Herrell and Brown[2] have used sulfathiazole and sulfapyridine as well as sulfanilamide in the local treatment of various wounds, chiefly in the form of a thick suspension or as a dusting powder. Their conclusions, which are virtually in agreement with Dr. Sinclair's, are as follows:

"Experimental and clinical observations tend to indicate that the local administration of sulfamido compounds exerts, in a certain number of cases, a definite beneficial effect in the course of infected wounds. This is true of postoperative infected wounds as well as wounds which may result either from accidental injuries or injuries incident to war. Our results following this form of treatment in twenty-one cases are presented. The results are by no means uniform. However, we feel that they are encouraging enough to justify a continuation of this procedure. Sufficient evidence is at hand to indicate that the continued local application of sulfamido compounds as a prophylactic measure in any of the wounds mentioned is justifiable."

1. Mayo, C. W., and Miller, J. M.: Solution of Sulfanilamide in the Local Treatment of Wounds, Proc. Staff Meet. Mayo Clinic, 15:609 (Sept. 25) 1940.
2. Herrell, W. E., and Brown, A. E.: Local Use of Sulfamido Compounds in the Treatment of Infected Wounds, Proc. Staff Meet. Mayo Clinic, 15:611 (Sept. 25) 1940.

* * * *

AN INTRIGUING EXPERIMENT

Doubtless every doctor has longed more than once for some instrument which would measure an individual's ability to endure pain—or, perhaps more important, would register the amount of pain an individual was actually suffering—as accurately as a thermometer registers the temperature. A long step in this direction has been taken by Dr. R. M. Wilder, Jr., and described by him in the *Proceedings* of the Staff Meetings of the Mayo Clinic for August 28, 1940. As in the case of Columbus and his famous egg, the procedure employed for determining an individual's pain index is so simple that one wonders why he himself did not think of it long ago. Dr. Wilder's own description of the technique can not be improved upon:

"The apparatus employed is simple and consists of a piece of roughened metal (such as is used in food graters) which is sewed to the contact surface of an ordinary blood pressure cuff. Without letting the patient know that any test other than that of taking his blood pressure is to be made, the cuff is wrapped on his arm in the usual way, care being exercised to place the metal grater at a point on the medial surface of the arm just above the elbow. The cuff is then inflated as usual; the sensitivity level is indicated by that point at which the patient first shows evidence of distress by wincing, by changing expression, or in some cases by crying out. The nearest 10 mm. mark on the mercury manometer, when such a reac-

tion occurs, is taken as the pain point. To reduce the possibility of error, the cuff is inflated slowly, increasing the pressure by about 10 mm. of mercury per second. This modified sphygmomanometer cuff may be used in taking blood pressures, and I was surprised to find that the discomfort did not cause much increase in blood pressure in most instances.

"The test was used routinely on an unselected group of patients with one exception, namely, that patients with known moderate to severe hypertension were excluded because: 1. It was believed that frequently it would be necessary to increase the manometric pressure to excessively painful levels in order to obtain the systolic blood pressure. 2. Patients with hypertension usually have had frequent blood pressure readings made in the past and are quicker to notice the unaccustomed sensation when the modified sphygmomanometer cuff is applied."

Dr. Wilder found that "the skin threshold of pain is much lower in women than in men. . . . Slightly more than 61 per cent of the women had pain thresholds lower than 120 mm., whereas only 25 per cent of the men are included in this group."

As was to be expected, an appreciably higher proportion of both men and women with low levels of pain sensitivity were among those that would be classified as constitutional inadequates. A striking illustration of this finding recently came to the attention of a local physician while he was examining an eighteen year old high school girl who complained of frequent "agonizing" headaches—so severe that she could not stay in school. When her blood pressure was taken — without the nutmeg grater attachment in the cuff—she protested loudly that she could not stand the "pain" when the pressure reached 116. She was shielded by her mother—but her father said that she was more interested in boys than in books, and was in imminent danger of failing her examinations.

Dr. Wilder is to be commended for having originated what promises to be a most valuable procedure. Certainly the male sex owes him a hearty vote of thanks for having refuted the canard that women stand pain better than do men.

ILLUSTRATIONS AND EYE STRAIN

The *New England Journal of Medicine* is one of our favorite exchanges, and its content, editorial and scientific, always carries weight. An editorial in the issue for August 15 discusses a problem that is of interest to every one connected with the publication of a medical journal: "The question of how best to reproduce x-ray and other photographs." In order to get the best results in reproducing cuts, our Yankee colleague states, four requirements must be met: The original film must be well taken; the reduction must not be too great; a fine screen must be used; and the cuts must be printed on a heavy grade of coated paper. The editorial explained that the excessive cost of the coated paper forbade its use by the *New England Journal*, and closed with the hope that eventually it would be able to afford this luxury.

The editorial board of the NORTH CAROLINA MEDICAL JOURNAL has also considered this question of how best to reproduce illustrations, but is convinced that the soft finish book paper we are now using is preferable to the coated or glazed paper, in spite of some loss of detail in the illustrations. Although our printer informed us that the coated paper would cost very little, if any, more than the paper we are now using, we decided against it because the highly glazed surface creates a glare, particularly under artificial light, which is much harder on the eyes than is the soft finish paper. With a magazine made up largely of pictures, such as *Life* or *Look*, the use of glazed paper is necessary; but in such magazines as the *Atlantic Monthly* or *Harper's*, made up chiefly of reading matter, the soft finish paper is used. In the NORTH CAROLINA MEDICAL JOURNAL, so much more space is devoted to printed matter than to illustrations that we believe the book paper is preferable.

* * * *

The newspapers announce that North Carolina will have the lowest quota of draftees in the nation, because it has the highest proportion of volunteers. Until very recently, at least, the North Carolina medical profession was next to the bottom of the list in the proportion of questionnaires returned. Certainly it does not belong in that lowly position. Have *you* filled out your questionnaire?

CASE REPORTS

CLINICO-PATHOLOGICAL CONFERENCE

DUKE HOSPITAL

August 9, 1940

Dr. William M. Nicholson (reading the clinical summary):

The patient, a forty-three year old colored housewife, was admitted to the hospital in coma that had existed for the previous twelve hours.

The family history revealed no evidence that any of her immediate family had hypertension, heart or kidney disease.

Past History: Previous to 1931, when the patient was first seen in this hospital, her past history is of little interest. In 1931 she was admitted to this hospital, and a diagnosis of chronic pelvic inflammatory disease with intra-abdominal adhesions was made. A laparotomy was performed at this time, and it is interesting to note that the operator made a comment on the dense adhesions found in the pelvis; because of these he felt justified in doing only a hysteromyomectomy. The postoperative course from this operation was quite stormy, and she remained in the hospital for several weeks. After her discharge from the hospital she returned to various clinics, complaining of nausea, vomiting and constipation. These symptoms were interpreted by various observers as being due to partial intestinal obstruction. One year after her first admission she was admitted to the hospital again, and a diagnosis of pyelonephrosis due to ureteral obstruction was made. This diagnosis was confirmed by retrograde pyelograms which showed on the right a tremendously dilated ureter with considerable dilatation of the kidney pelvis. Following ureteral catheterization for drainage of infected urine from that kidney, the patient was discharged greatly improved. She was then followed in the Urological Clinic from time to time, and continued to complain of vague abdominal aches and pains with occasional chills and fever.

The third admission was in 1937, at which time the patient had repeated epidural injections and the application of a right hip spica for the relief of sciatic pain. It is interesting to note that repeated blood pressure determinations during her stay in the hospital and her visits to the out-patient clinics showed her blood pressure to be well within normal limits. From 1937 until May, 1940, the patient had not been seen in the clinics. At that time she was again seen in the clinic, complaining of the same vague aches and pains in her abdomen with occasional chills and fever. Her right ureter was again catheterized, and retrograde pyelograms showed even more distention of the ureter and distention and distortion of the pelvis of the kidney on the right side. For the first time a note is made that her blood pressure was elevated at a level of 180/126.

Present Illness: For one week before her admission to the hospital the patient complained of severe generalized headache, drowsiness, listlessness, nausea and vomiting. She had remained in bed during most of this time. Twelve hours before admission to the hospital she lapsed into a deep coma, from which she could be aroused only with great difficulty.

Physical Examination: The temperature on admission was 37.5 C, the pulse 86 and the respirations 20. The blood pressure was 290/150. The patient was a well-developed, obese Negro female of forty-three who was quite stuporous and could not be aroused. The skin was dry without evidence of dehydration. The pupils were quite small, but reacted to light. There was moderate bilateral exophthalmos. Ophthalmoscopic examination showed the disks to be blurred, but no papilloedema could be made out. The vessels were narrowed, with typical silver wire appearance. There were no hemorrhages or exudates. The breath was not uriniferous. There were a few scattered coarse rhonchi throughout both lungs; otherwise no abnormalities in the lungs could be made out. The heart was not enlarged to percussion; however, the point of maximal impulse was seen in the sixth interspace to the left, 10 cm. from the midsternal line. The sounds were of good quality, and no murmurs could be heard. The second aortic sound was louder than the second pulmonic. The rate was not increased, and the rhythm was regular. Abdominal examination revealed moderate tenderness to deep palpation in the right flank. No masses or viscera could be palpated. The neurological examination showed the motor system to be intact; the extremities were somewhat hypertonic, but no abnormal weakness was

noted. The cranial nerves were normal so far as they could be tested. The tendon reflexes were present, equal and active bilaterally. The abdominal reflexes were absent. However, no Babinski sign was present. Sensory examination could not be done.

Accessory Clinical Findings: The hemoglobin was 14.5 Gm. or 93.5 per cent. The red blood cells were 5,300,000. The white blood cells were 8,500 with a normal differential picture. The blood Wassermann and Kahn reactions were negative. Fresh and stained preparations of the peripheral blood showed no marked abnormalities. A catheterized specimen of urine showed a specific gravity of 1.025, an alkaline reaction, no sugar, and a 3 plus reaction for albumin; the sediment showed 5-6 red blood cells, 3-4 white blood cells per high powered field and an occasional granular cast. A lumbar puncture allowed the escape of 20 cc. of clear, limpid fluid under increased pressure. One mononuclear cell was found, and the Pandy reaction was 1 plus. A colloidal mastic test on the spinal fluid gave a curve of 1-2-3-2-1-1, and the Wassermann on the spinal fluid was likewise negative. Blood bromides were negative. Blood non-protein nitrogen on admission was 85 mg. per cent.

Course in the Hospital: The patient was placed at complete bed rest, and fluids were restricted to 1200 cc. per day. Supportive therapy was instituted; however, on the third hospital day the patient's temperature began to rise, and at the end of the fifth hospital day, immediately before death, it had reached a peak of 42 C. On the same day the blood non-protein nitrogen was 175 mg. per cent.

Discussion

Dr. Nicholson: All of the available facts in this patient's history, examination and laboratory studies point toward severe renal damage. There are three pathological conditions that one must consider before arriving at a final and definite conclusion in regard to the underlying pathological changes that we expect to find at postmortem examinations. These are:

(1) Chronic glomerulonephritis
(2) Malignant nephrosclerosis
(3) Chronic pyelonephritis
(4) A combination of the above.

Fortunately, we were able to follow this patient over a period of nine years, during which time repeated urine analyses failed to show any increase in the component elements of the sediment. White cells were found on occasions, but only rarely were red cells seen and no casts were described at any time. There was likewise no albumin present in the urine. It is interesting to note, however, that upon catheterization of the right ureter pus cells and bacteria in profusion were found. On the final admission to the hospital red cells were found in the urine, and for that reason glomerulonephritis must be considered. However there were no hemorrhages, exudates or scars in the retinae which one would expect to find had this been glomerulonephritis of long duration.

As far as the question of malignant nephrosclerosis is concerned, the exclusion of this is considerably more difficult; hence, it will be discussed later. There must have been some changes in the kidneys which are compatible with this pathological process.

We have definite evidence, as shown by the x-rays, that pyelonephritis on the right side existed in this patient for a period of eight years.

Dr. Robert J. Reeves: The hydronephrosis of the right kidney seems to be mechanical and probably due to adhesions or a deep mass in the pelvis producing pressure on the ureter. This type of obstruction is gradual and the symptoms are not so evident as when there is a block by a stone.

Dr. Nicholson: With the information at hand, it seems fairly easy to reconstruct the clinical picture that this patient presented. We know that nine years previously she had had a pelvic operation, at which the operator was unable to remove all of the dense adhesions and infected masses that he found in the pelvis. We have seen by the x-rays that the obstruction to the ureter occurred at the pelvic brim. Undoubtedly, the mass in the pelvis was responsible for the obstruction which we see demonstrated in the x-rays. Gradually over a period of years, owing to the obstruction of the ureter chronic pyelonephritis developed. Undoubtedly, had the patient not been catheterized, death would have intervened several years previous to this time. However, sufficient drainage was established from time to time to prolong her life so that the typically small, contracted, diffusely scarred kidney would develop. Under these circumstances it would seem that a modified Goldblatt experiment

in the human being had been produced. Undoubtedly, the chronic infection of the right kidney with obstruction to the arterial flow produced the substance that has been described as renin, which has been shown in experimental animals to produce hypertension. From the resulting hypertension arteriolosclerosis must have been produced in the opposite kidney and other organs of the body as well. In reviewing her history again we are unable to state definitely just what was the interval between the onset of the hypertension and her death. We do know, however, that in 1937, three years before her final admission, the blood pressure was recorded as being normal. However, two months before the final admission the blood pressure was 180/126. I would like to present, therefore, as the anatomical diagnosis the following conditions in the order of appearance:

(1) Chronic pelvic inflammatory disease with fibromyoma of the uterus removed at operation with resulting pelvic adhesions.

(2) Chronic pyelonephritis and hydroureter on the right side.

(3) Nephrosclerosis of the left kidney and arteriolosclerosis of the remaining organs of the body.

The final episode is not particularly clear to me. Two questions are to be asked:

(1) Did this patient die from uremia?

(2) Was her death due to cerebral vascular changes such as a hypertensive crisis and not a hemorrhage or thrombosis of the cerebral vessels?

Upon her admission to the hospital there was little evidence of uremia, since her blood non-protein nitrogen was only 85 mg. per cent, the breath was described as not being uriniferous, and there was no bloody diarrhea such as is usually present. It is noted, however, that her blood non-protein nitrogen rose to 175 mg. per cent on the day of her death; however, that may have been related in some manner to the restriction of fluids. While one cannot be sure that this was a so-called hypertensive crisis, I would like to predict that Dr. Baker does not find any evidence that we usually associate with uremia.

Dr. George T. Harrell: I should like to ask Dr. Nicholson if he thinks that this patient would have completely recovered had a nephrectomy been done on the right.

Dr. Nicholson: Yes, it is my opinion that this patient would have recovered had a nephrectomy been done previous to 1937 while she was still being followed in the clinic. It would appear that the production of the pressor substance from the damaged kidney had been more abundant since that time, since the patient had not received further dilatations of the ureter.

Pathological Report

Dr. Roger Baker (presenting gross organs): When the peritoneal cavity was entered at post-mortem examination, fibrous adhesions were found in profusion binding each viscus to its neighbor. In the pelvis the adhesions, particularly dense, were firmly bound to what was left of the uterus. On the right side of the pelvis lay a cystic mass, the largest cyst of which is about the size of a turkey egg and filled with mahogany-colored fluid. It is not clear, even after microscopic study, whether this mass is of "inflammatory" or of ovarian origin. So much dense fibrous tissue is present that relationship and origins are not evident.

At any rate, this mass together with the adjacent connective tissue was sufficient to cause a very marked displacement of the right ureter. The angulation and kinking of the right ureter had produced obstruction. As you note, the whole right ureter from this point of angulation to the right kidney is greatly dilated, measuring 1.5 cm. in diameter. The right kidney is greatly shrunken and weighs only 60 Gm. It shows irregular depressions and also a finely nodular surface. With its dilated pelvis it presents the appearance of an old chronic pyelonephritis or pyonephrosis with scarring. It seems to us entirely possible, as Dr. Nicholson suggests, that the rest of the changes in the body may be dependent upon abnormal secretion of a substance into the blood stream from this damaged kidney.

Turning to the highly contrasting left kidney, we find that this weighs 140 Gm., only slightly less than normal. It has a finely granular surface with many yellowish areas. On this side neither pelvis nor ureter is dilated. The hypertension noted clinically is not apparent in any change in size or weight of the heart, nor is there evidence elsewhere, as in the lungs or liver, of heart failure. Probably the hypertension had not existed long enough to cause cardiac hypertrophy. The lungs are rather heavy. Patches of lobu-

lar pneumonia are present. Uremic colitis is absent and there is no fibrinous pericarditis such as is seen in some cases of uremia. The left corpus striatum of the brain contains a slit-like area of encephalomalacia 1 cm. long. This looks old. In the absence of any gross hemorrhage or large area of softening it is felt that the inconspicuous cerebral lesion is not as significant as the increased blood non-protein nitrogen in the fatal outcome. However that may be, the stupor of the patient gave rise to lobular pneumonia, which is the immediate cause of death. Microscopic sections show the pneumonia to be extensive.

The kidneys are, of course, extraordinarily interesting in microscopic section. The right one shows healed chronic pyelonephritis in most areas. In some regions, however, the picture is that of the left kidney. In the left kidney, glomerulonephritis can be ruled out. Arteriolosclerotic vascular changes are present in this kidney (and in the right kidney, too) as well as in the pancreas, spleen, and fibrous capsule of the adrenal glands. Also some thickening of the medium-sized vessels of the left kidney is noted. A great deal of recent tubular damage is present, with much fat and some hyalin droplets. Also necrotic changes in the glomeruli are noted and thickening of the basement membrane, which often goes along with hypertension. But in addition to all this, as one might expect in arteriolonephrosclerosis, there is definite infiltration of round cells in the cortex and also a moderate involvement by round cells of the pelvis of this left kidney. Hence, we have definite evidence of minimal chronic pyelonephritis, an incidental process rather than the chief one. Collapsed renal tissue and hyalinized glomeruli are not noted on the left as they were on the right.

From pathological study, therefore, we are inclined to agree with Dr. Nicholson that the pyelonephritis in the right kidney may well have been responsible for the vascular damage of the arterioles throughout the body and for the arteriolar nephrosclerosis on the left side.

With regard to taking out the pyelonephritic kidney there are two considerations. In the first place, we cannot be absolutely sure that at this age, forty-three years, the arteriolosclerosis might not have developed in the absence of chronic pyelonephritis on one side. In the second place, one notes a slight amount of damage in the left kidney due to mild pyelonephritis. The question is whether there is enough damage in this kidney, or was enough damage in this kidney at one time, to have continued the process initiated by the other kidney, so that the removal of the more severely damaged kidney might not have been efficacious in preventing the passage of pressor substances into the blood stream.

Anatomical Diagnosis

Abdominal and pelvic adhesions.
Pelvic cyst with partial obstruction of the right ureter.
Chronic pyelonephritis with scarring, right.
Mild chronic pyelonephritis, left.
Generalized arteriolosclerosis.
Malignant nephrosclerosis.
Lobular pneumonia.
Minute old cerebral infarct.

During the draft the most rigid tuberculosis-control methods must go into effect to prevent a rapid rise of the disease among recruits from rural areas where tuberculosis has not been prevalent, according to Dr. Wm. Charles White, chairman of the Medical Research Committee of the National Tuberculosis Association.

"Among the draftees will be a great number of men who have never been exposed to tuberculosis", continued Dr. White. "When a non-tuberculous group of people is confronted by the disease, the cases that occur frequently run a more acute course."

To avoid the rapid rise of tuberculosis among recruits Dr. White emphasized that there must be a careful and complete elimination of tuberculous men during the draft and throughout cantonment life. This must be done not only to avoid breakdown among those with beginning infection, but also to avoid the spread of the highly communicable disease.

The Practitioner of the Future.—The romantic reverence for the old time practitioner, rich in qualities that made him the family adviser, confidant and friend, is fully justified. I am bold enough to claim, however, that there is in the making a young medical generation which, after a difficult and somewhat bewildering period, will be equally rich in these human qualities but which, in addition, will be able to do more for the welfare of the patients than their predecessors. The young practitioner of the future will be willing to give himself, will understand the springs of human emotions and will be able to give as good care in the majority of medical diseases as the best specialists of today. This new practitioner will once more have the confidence and the respect of the community.—Soma Weiss, M.D.: The Medical Student Before and After Graduation, J. A. M. A. 114:1718 (April 27) 1940.

BULLETIN BOARD

PRESIDENT'S MESSAGE

Socialized Medicine in North Carolina

Socialized Medicine may be described as that form of medical service which is paid for by individuals or groups of individuals through insurance companies or associations. It includes payment for illness, hospitalization and medical care. This form of medical service is growing in popularity in North Carolina.

The Hospital Saving Association of North Carolina, located at Chapel Hill, has 127,000 members, and stands eleventh in the United States in point of membership among the fifty-eight associations approved by the American Hospital Association. This association is sponsored by the Medical Society of the State of North Carolina, and its directorate has among its members officials of the Society. Another large North Carolina association has over 60,000 members. The affairs of these two companies are well conducted, and the larger association is now out of debt and has a surplus.

In soliciting members for surgical and medical care an association goes into a county upon the invitation of the County Medical Society and with the approval of a majority of its members. This procedure is within the limits of the constitution of the Medical Society of the State of North Carolina. Individuals and groups of individuals are being insured. Hospital and medical care is being provided at a very moderate cost for many people of limited means who would otherwise be unable to secure it. Partial payment of medical and surgical bills is now being offered in addition to hospitalization by one of the associations in the state.

There are certain dangers to the medical profession in this procedure. We may be asked by the individual to accept the insurance fees as payment in full for services rendered. This may be a lever for the insurance companies to obtain a lower fee schedule from the Medical Society for services which are incompatible with the fees offered. We may also be setting up a schedule of lower fees for professional services which the Workmen's Compensation Commission may force us to adopt. It must also be remembered that if the funds are not available in the treasuries of the insurance companies the fees will be scaled down and prorated to the physicians to whom the fees are due. Physicians are thus called on to underwrite their own fees.

The danger to insurance companies lies in the fact that many patients will be hospitalized who could be treated at home; that the hospital stay will be prolonged unnecessarily; and that unnecessary tests will be made.

The whole-hearted cooperation of the physicians is necessary to make Socialized Medicine a success. More careful regulation by the insurance companies in the examination of hospital bills is already making for a more efficient financial structure and a prompt payment of just claims and bills. Prolonged stays in the hospital make fewer available rooms for the really sick. It is a natural human desire for a person to want to get his money back in the form of services from an insurance company. We can guide our patients in this matter for their own good as well as for the good of the association. Hospitalization of our sick makes for better care and treatment; more scientific medicine can be practiced; the physician is better satisfied, his work is easier, and he achieves better results. Therefore, we must protect our patients and the plan whereby they may receive hospitalization.

Socialized Medicine is here to stay. Practically 200,000 North Carolinians are members of our two large associations, and their rosters are increasing daily. We should then, as physicians, lend all of our endeavors in perfecting this instrument of good in our state.

News Notes from Duke University

On October 3, the School of Medicine and School of Nursing began their autumn quarters, with an enrollment of 262 students in the former, and 60 students in the latter.

On October 15, Dr. M. V. Giegler, Senior Surgeon of the United States Public Health Service, talked to the students at the daily clinic on "Opportunities in the Public Health Service."

The seventh annual Postgraduate Symposium was held at Duke Hospital October 31, November 1 and 2. The subject was Diseases of Metabolism and Diseases of the Blood Forming Organs.

News Notes from the University of North Carolina

Dr. Howard B. Lewis, Professor of Biological Chemistry of the Medical School of the University of Michigan and Director of the College of Pharmacy at Ann Arbor, visited the Medical School of the University of North Carolina the week of October 14-20. He lectured to the Sigma XI Society on "The Chemical Viewpoint in Biology".

The annual regional meeting of the American College of Physicians was held at the Medical School on October 11 and 12. Dr. Charles H. Cocke, of Asheville, Governor for this District, presided. Dr. James B. Bruce, President of the College, was the guest speaker.

On the afternoon of October 11 a portrait of Dr. I. H. Manning, former Dean and Professor of Physiology in the Medical School, now Kenan Emeritus Professor of Physiology, was presented by the Alumni Association of the Medical School to the University. The portrait was hung in the Medical School Library, and was accepted by President Graham for the University.

The total registration in the School of Medicine is 81. There are 48 students in the first-year class and 33 in the second-year. In addition there are 29 graduate students taking courses in the Medical School.

Dr. William L. Fleming was in Hot Springs, Arkansas, during the week of October 13, where he gave lectures in the Postgraduate Training Course at the Venereal Disease Medical Center. These lectures are given under the auspices of the U. S. Public Health Service.

Dr. M. J. Rosenau, Dr. John J. Wright, and Dr. Harold W. Brown were in Detroit, Michigan, during the week of October 6 for the meetings of the American Public Health Association.

Dr. John J. Wright has been at Johns Hopkins in Baltimore for the past six weeks observing the syphilis control work being carried on in the Eastern District by the City of Baltimore.

Dr. W. S. Rankin, Director of The Duke Endowment, Dr. V. M. Hoge, of the U. S. Public Health Service, and Dr. W. C. Davison, Dean of Duke Medical School, were in Chapel Hill Monday, October 21, on an inspection survey.

News Notes from Wake Forest College

Wake Forest Medical School has been awarded a Carnegie Fellowship in Human Genetics, and the Fellow under this grant is Dr. C. N. Herndon. Dr. Herndon has been added to the staff of the Department of Medicine as a Carnegie Fellow in Human Genetics. He is for the present assigned to Dr. William Allan of Charlotte.

Arrangements have been made for Dr. Laurence H. Snyder, Professor of Medical Genetics at the Ohio State University, to give a series of lectures to the medical students and faculty of Wake Forest College, the University of North Carolina and Duke University during the months of January, February and March.

Dr. Howard H. Bradshaw, Professor of Surgery, attended the meeting of the Association of American Medical Colleges in Ann Arbor, Michigan, October 28-30.

Dr. Robert P. Morehead and Dr. Herbert S. Wells spoke before the Forsyth County Medical Society at the last regular monthly meeting. Dr. Morehead's subject was, "Pathology of Appendicitis." Dr. Wells discussed "Hookworm Infestation" and showed a motion picture made by him of the worms in the gastrointestinal tract of the dog.

News Notes from the State Board of Health

Success of the North Carolina plan for securing voluntary serologic tests among those registering for the draft seemed assured by 11 o'clock Wednesday, when, although material had been sent out for 90,000 such tests, fifteen county health officers had either wired or telephoned the State Board of Health at Raleigh for additional tubes.

* * *

North Carolina led the entire United States in the number of diphtheria cases reported during the week ending September 28, according to official figures just received from Washington by Dr. Carl V. Reynolds, State Health Officer.

For North Carolina, with its 1940 population of 3,563,174, there were 46 cases reported during that week, as compared with 14 cases for New York, with its population of 13,379,662. Cases reported from surrounding Southern states were as follows: Virginia, 10; South Carolina, 8; Georgia, 18; and Tennessee, 10.

Dr. Reynolds pointed out that during the corresponding week in 1939 there were 115 diphtheria deaths in North Carolina, but that this year, "with North Carolina's compulsory immunization law requiring inoculation of all infants during the first year of life and as a condition of admission to any school, public, parochial or private, now in full force and effect, the number of cases should have been practically nil. This law became effective January 1, 1940."

* * *

Sixty-three trainees, the largest number on record, have registered in the School of Public Health of the University of North Carolina, it was announced here by Dr. Milton J. Rosenau, the dean. This school is attended by trainees from Region No. 2 of the United States Public Health Service, which includes nine states from Delaware to Florida, including West Virginia.

News Notes from the North Carolina Tuberculosis Association

The October **Bulletin**, monthly publication of the National Tuberculosis Association announces that Dr. P. A. Yoder has been selected on the Nomination Committee of the American Trudeau Society. Dr. Yoder is the Superintendent of the Forsyth County Sanatorium and a member of the Executive Committee of the North Carolina Tuberculosis Association.

Three new county tuberculosis associations in Craven, Wayne, and Lenoir Counties have been formed this fall.

North Carolina Neurological and Psychiatric Association

The North Carolina Neurological and Psychiatric Association met at the State Hospital in Goldsboro on October 25 at 2:30 p. m. A clinic was held, with the presentation of a number of interesting cases by the State Hospital Staff. This was followed by a talk on "Differences in Insanity as it Occurs in White and Negro Races", by Dr. F. L. Whelpley, and a demonstration of electric convulsion therapy in mental disorders. Dr. S. E. Barrera, Principal Research Psychiatrist of the New York State Psychiatric Institute and Hospital, gave an address on "Some Recent Studies in Epilepsy." A barbecue dinner was served at 5:00 p. m.

Thermal Belt Medical Society

The Thermal Belt Medical Society met at the American Legion Community Building in Shelby on October 17 at 7:00 p. m. The following program was presented:

"X-Ray Treatment of Infections"—Dr. J. Rush Shull, Charlotte

Discussion by Dr. Allen Tuggle, Charlotte.

Case Report—Dr. J. H. McNeill, North Wilkesboro.

"Diathermy and Fever Therapy as Supplementary Therapy in Problem Cases"—Dr. J. S. Holbrook, Statesville, and Dr. Felda Hightower, Raleigh.

Fifth District Medical Society

The Fifth District Medical Society held a meeting at the new Veterans Hospital in Fayetteville on October 24, at 3:30 p. m., with the medical officers of the hospital as hosts. Dr. B. A. Cockrell, Chief Medical Officer, gave a talk on "History of and Benefits Provided by the Veterans Administration"; Dr. J. Lamar Callaway, Professor of Dermatology at Duke University, spoke on "Control of Syphilis: The Practitioner's Problem"; Dr. W. M. Bland, Chief Surgeon, gave a paper on "Preoperative Diagnosis of Gall Bladder Diseases"; and Lt. Col. John H. Sturgeon spoke on the "Physical Requirements for Enlistment in the United States Army". Dinner was served following the scientific meeting.

Seventh District Medical Society

The Seventh District Medical Society will hold its next meeting in the Y. M. C. A. at Kannapolis on November 19. There will be four papers and a two-hour clinic on medicine. A banquet will be held at the Hotel Concord in Concord at 7:00 p. m., followed by the scientific address.

Eighth District Medical Society

The Eighth District Medical Society held its fall meeting on October 30, at the Belvedere Hotel in Reidsville at 2:00 p. m. The following program was presented at the afternoon session:

"Diagnosis and Treatment of Upper Urinary Tract Infection"—Dr. L. W. Holladay, High Point.

"Surgical Aspects of Peptic Ulcer"—Dr. W. H. Sprunt, Jr., Winston-Salem.

"Treatment of Pneumonia with Reference to Chemotherapy"—Dr. Roy C. Mitchell, Mt. Airy.

"Eclampsia Placenta Previa and Cesarean Section"—Dr. R. B. Dunn, Greensboro.

"Treatment of the Menopause"—Dr. G. C. Cook, Winston-Salem.

"Diabetes and Its Complications"—Dr. J. T. Taylor, Greensboro

"Low Back Pain"—Dr. J. F. Register, Greensboro.

Dinner was served at 6:30, and Dr. C. C. Carpenter, Dean of the Bowman Gray School of Medicine of Wake Forest College, gave an address on "The Medical School and Medical Practice".

Halifax County Medical Society

The Halifax County Medical Society met in regular session, with a full attendance, at Roanoke Rapids Hospital on Friday evening, October 11. Dr. Wilburt C. Davison of Duke University School of Medicine was guest speaker of the evening. Dr. Davison, whose subject was "Treatment of Diarrhea in Infancy and Immunizations for Childhood Diseases", presented a most interesting discussion on this topic.

Buncombe County Medical Society

The Buncombe County Medical Society held its eighteenth meeting for 1940 on October 7 at 8:00 p. m. at the City Hall in Asheville. Dr. F. Webb Griffith, Chairman of the Preparedness Committee of the Medical Society of the State of North Carolina gave a most instructive talk on "Medical Preparedness", listing the results of his recent trip to Chicago on this matter. At the business session held following this talk, Dr. C. C. Orr, Sr., was elected as chairman of a draft advisory committee for the physicians of Buncombe County, with Dr. L. M. Griffith and Dr. O. F. Eckel to serve on the committee. Dr. C. C. Orr, Jr., was received into the Society by transfer from Charlottesville, Va., and Dr. Eugene M. Carr was reelected into the membership of the Society.

At the second monthly meeting of the Society, held on October 21, a paper on "Addison's Disease" by Dr. Paul H. Ringer and Dr. Wilson Pendleton was presented, and a Case Report on "Carotid Sinus Syndrome" was given by the guest speaker, Dr. James R. Saunders of Morganton.

Guilford County Medical Society

The Guilford County Medical Society held a business meeting on October 3 at the King Cotton Hotel in Greensboro at 6:30 p. m. A committee consisting of Dr. C. C. Hudson, chairman, Dr. Fred Patterson, Dr. R. B. Davis, and Dr. A. C. Banner was anpointed to coordinate the welfare clinics in Greensboro and secure more space for them. A committee on medical preparedness was also appointed, with Dr. I. T. Mann as chairman, and Dr. B. E. Rhudy and J. W. Tankersley as members. An obituary of Dr. J. T. J. Battle was read. The name of Dr. H. C. Lennon was presented for membership by transfer from the Philadelphia County Medical Society. The following officers were elected for 1941: President, Dr. F. M. Patterson; vice president, Dr. B. E. Rhudy; treasurer, Dr. E. D. Apple; secretary, Dr. Wayne Benton; delegate to the State Medical Society, Dr. George T. Wood; Board of Censors, Dr. C. E. Jennings.

Mecklenburg County Medical Society

The first monthly meeting of the Mecklenburg County Medical Society was held on October 1. Dr. Robert H. Lafferty gave a "History of North Carolina Medical College", and Dr. Harry Winkler spoke on "Spontaneous Fractures of the Spine Due to Gradual Decalcification". On October 15 Dr. Tom C. Bost gave a case report on "Gun-Shot Wounds of the Pregnant Uterus", and Dr. Andrew Blair read a paper on the "Clinical Course of Nephrosis".

Charlotte Memorial Hospital

The October issue of the **Bulletin** of the Mecklenburg County Medical Society is devoted to the new Charlotte Memorial Hospital, which was dedicated on October 1 and opened on October 7. At the dedication program addresses were given by Dr. William H. Walsh of Chicago, hospital consultant; Dr. Malcolm T. MacEachern of Chicago, C.M.D.Sc., director of Hospital Activities, American College of Surgeons; and C. Russell Shetterly, associate general counsel, Public Works Administration, Washington. The dedicatory address was given by Governor Clyde Hoey. Dr. Hamilton W. McKay is Chairman of the Medical Advisory Committee, and Dr. Brodie C. Nalle is President of the Medical Staff.

The A. M. A. Broadcast

DOCTORS AT WORK is the title of the sixth annual series of dramatized radio programs to be presented by the American Medical Association and the National Broadcasting Company.

The series will open Wednesday, November 13, 1940, and run for thirty consecutive weeks, closing with a broadcast from the A. M. A. meeting at Cleveland, on June 3, 1941. The program is scheduled for 10:30 p. m. Eastern Standard Time over the Blue network, other NBC stations and Canadian stations.

The programs will dramatize what modern medicine offers the individual in the way of opportunities for better health and the more successful treatment of disease. Incidental to this main theme, the programs will explain the characteristics of the different fields of modern medicine and its specialties.

DOCTORS AT WORK will be broadcast from scripts by Wm. J. Murphy, NBC script writer and author of many previous AMA-NBC "shows" and other popular radio features. It will be produced under the direction of J. Clinton Stanley, director of MEDICINE IN THE NEWS, last season's successful AMA-NBC health program. Supervision will be by the AMA Bureau of Health Education, directed by W. W. Bauer, M.D.

Descriptive posters for local distribution may be had gratis from the Bureau of Health Education, American Medical Association, 535 North Dearborn Street, Chicago. Program titles will be announced in The **Journal of the AMA** and monthly in **Hygeia.**

American Conference on Industrial Health

Industrial physicians and manufacturers from all over the country will attend the American Conference on Industrial Health to be held Thursday, November 14, at the Towers Club in Chicago. The conference will be sponsored by the American Association of Industrial Physicians and Surgeons, a 25-year old organization.

This first meeting of the American Conference on Industrial Health has for its purpose the correlation of viewpoints of all persons who are interested in promoting industrial health.

Among the prominent speakers who will talk at the convention sessions are: Dr. Morris Fishbein, editor of the American Medical Association Journal; Mr. B. C. Heacock, president of the Caterpillar Tractor Company of Peoria; Dr. Volney S. Cheney, medical director of Armour and Company; and J. M. Conway, representing the National Association of Manufacturers, New York.

The conference, which is scheduled to begin at 9:30 a. m., will conclude with a dinner session at which Dr. Fishbein and Mr. Conway will speak.

Postgraduate Courses

The Department of Obstetrics and Gynecology of the University of Chicago and the Chicago Lying-In Hospital through the cooperation of the Children's Bureau, U. S. Department of Labor and the Illinois State Department of Public Health offers five postgraduate courses of four weeks each between January 6 and June 21. The beginning dates of each are: January 6, February 10, March 17, April 21, and May 26. All the members of the department and all services and units of the institution participate in the instruction. Only a limited number of postgraduate students are accepted for each period. A deposit of $25.00 is required, of which $10.00 is returned on completion of the course. All communications should be addressed to: Postgraduate Course, 5848 Drexel Avenue, Chicago, Illinois.

The Georgia Pediatric Society

The Scientific Committee of the Georgia Pediatric Society wishes to announce that its Annual Scientific Meeting will be held in Atlanta on December 12, beginning with a luncheon at 12:30 and an afternoon and evening session.

The following nationally known physicians will appear on the program:

Lee Edward Farr, M.D., Director of Research of the Alfred I. DuPont Institute, Wilmington, Delaware, will speak on: The Prognostic Value of Renal Function Tests in Nephritis, and The Role of Diet in the Therapy of Nephritis.

Samuel Zachary Levine, M.D., Professor of Pediatrics, Cornell University Medical College, New York, will speak on: The Handicaps of Prematurity and How to Meet Them, and Water and The Growing Organism.

Edward F. Bland, M.D., Instructor of Medicine, Harvard Medical School and Assistant Physician Massachusetts General Hospital, Boston, Massachusetts, will speak on: The Manifestations of Rheumatic Fever in Childhood, and the Course of Rheumatic Heart Disease in Childhood and Adolescence.

Scientific Committee Georgia
Pediatric Society
W. W. Anderson, M.D.
C. Dixon Fowler, M.D.
Joseph Yampolsky, M.D., Chm.

Announcement to Authors

An announcement from Colonel Harold W. Jones, Librarian of the Army Medical Library in Washington, states that "Authors' reprints are gratefully received at the Army Medical Library. They are placed in a special collection catalogued by author and thus form a ready bibliography of the work of any given writer and a valuable supplementary source of material when the volume of original publication is temporarily unavailable at the bindery or on loan."

Correction

In the article by Dr. Roy Norton, "A Quarter-Century of Health Progress in North Carolina", which appeared in the October issue of the **North Carolina Medical Journal**, there was a mistake in the table of Illnesses and Deaths in North Carolina for 1914 and 1939. Under Infants Under One Year, for 1914, the number of deaths should read 6,224 rather than 62,245; and for 1939, the number should read 4,704 rather than 47,046.

News Notes

Dr. William B. Adams, formerly of Indianapolis, has opened offices in the Professional Building in Charlotte for the practice of anesthesia in association with Dr. William Hamer.

* * *

Dr. Duncan Calder has located in Charlotte for the practice of surgery. He has offices with Dr. T. D. Sparrow in the Professional Building.

* * *

Three North Carolinians have qualified for appointment in the United States Navy medical corps and have been commissioned with the rank of lieutenant (junior grade).

Those commissioned are Walter E. Brown of Rocky Mount, John H. Keller of China Grove and Grant F. Mollring of Smithfield. All are practicing physicians.

Their rank of assistant surgeons became effective as of October 2.

WOMAN'S AUXILIARY

A STATEMENT FROM THE WOMAN'S AUXILIARY TO THE AMERICAN MEDICAL ASSOCIATION

The Woman's Auxiliary to the American Medical Association is making a special effort at this time to awaken wide-spread interest in its activities, by increasing the number of readers of the *Bulletin.*

This little booklet is a successor to the News Letter which for many years has kept the officers and board members acquainted with the progress of the Auxiliaries of all the States. It is published quarterly and contains reports of conventions, places of work, inspirational messages from leaders, and news of the hour in the medical world.

It is a great help in promoting interest in local Auxiliaries, especially where the program is new.

The Fall issue contains the inaugural address of Mrs. V. E. Holcombe, the National Auxiliary president. Also a message to women from Dr. Van Etten, president of the American Medical Association. Many other interesting items are to be found within its forty pages. It is hoped to have 6000 women, one-fourth of the membership, reading the *Bulletin* before the year is over. In this way the members may keep abreast of the trends in the medical world and be better able to function as members and leaders of the Auxiliaries in local, state, and national.

The cooperation of the Advisory Councils and the good-will of all members of Medical Associations is earnestly requested.

MRS. GEO. H. EWELL, *Editor*
MRS. H. E. CHRISTENBERRY, *Cir. Mgr.*

MEETING OF THE NINTH DISTRICT AUXILIARY

The Ninth District Medical Auxiliary held its fall meeting at the Mooresville Hospital Nurses Home on Thursday, September 28, with the Mooresville doctors' wives as hostesses.

The meeting was called to order by the acting president, Mrs. Alfred A. Kent, Jr., of Granite Falls. Mrs. Ralph Lore of Lenoir, secretary-treasurer, read the minutes of the preceding meeting held in Morganton in 1939.

Mrs. Carl V. Reynolds of Raleigh, a special guest, was recognized. Mrs. Clyde R. Hedrick, President of the Woman's Auxiliary to the Medical Society of the State of North Carolina, spoke on some of the workings of the State Auxiliary, urging the local doctors' wives to organize. She brought out the fact that active county and district auxiliaries make for a more enjoyable State Auxiliary meeting.

The following officers were elected for 1941:

President—Mrs. L. M. Little, Statesville
Vice President—Mrs. O. J. Corpening, Granite Falls
Secretary-Treasurer — Mrs. C. L. Bittinger, Mooresville

Mrs. C. L. Wilson of Lenoir was named chairman of the nominating committee. The 1941 meeting of the Ninth District Medical Auxiliary will be held in Statesville in September. The date is to be announced.

The auxiliary was entertained at tea in the homes of Mrs. G. W. Taylor and Mrs. A. B. Sloan. At seven o'clock the ladies joined the doctors of the Ninth District Society for dinner and for the address by the guest speaker of the society.

BOOK REVIEWS

Physical Diagnosis. By Ralph H. Major, M.D., Professor of Medicine in the University of Kansas. Second Edition, 464 pages with 437 illustrations. Philadelphia and London: W. B. Saunders Company, 1940. $5.00.

The second edition of this excellent work on physical diagnosis brings the subject up to date; the excellent illustrations make the text more vivid; and Dr. Major's ability to write clearly and with sustained interest makes the study of physical diagnosis really attractive. While the author goes into detail in explaining the various techniques employed in examining a patient, he has the happy faculty of using every word in its right place, and of never using a superfluous word. The final chapter, "History taking and recording", is packed with common sense advice by which the medical student or practitioner may well profit.

It gives a North Carolinian a thrill of pride to see in the preface that our own Dr. Frederic M. Hanes is given special mention as having "suggested numerous improvements in arrangement, text, and in presentation."

Bacillary and Rickettsial Infections, Acute and Chronic. By William H. Holmes, Professor of Medicine, Northwestern University Medical School; Chairman, Department of Medicine, Passavant Memorial Hospital, Chicago. 676 pages. New York: The Macmillan Company, 1940. $6.00.

This book is unique in the field of medical publications. As Dr. Holmes states in the preface, it is not intended to be a complete textbook of medicine, but represents only the teaching of a quarter of the course on didactic medicine at Northwestern University Medical School. The first impression one gets as he begins reading the book is that it is the work of a scholar. It gives far more of the historical background of the diseases considered than does the average medical textbook. The marginal annotations make it much easier to follow the text.

The diseases included in the book are listed as follows: The Pasteurella Infections, including Plague and Tularemia; the Rickettsial Infections, including Typhus Fever, Rocky Mountain Spotted Fever, Fievre Boutonneuse, African Tick-Typhus, Tsutsugamushi Fever; The Brucella Infections, including Undulant Fever; The Enteric Infections, including Cholera, Typhoid Fever, Paratyphoid Fevers and Acute Gastroenteritis, the Dysenteries and Clinically Related Conditions; Bacillary Intoxications, including Diphtheria, Botulism, Gas Gangrene; Hemophilus Infections, including Whooping Cough and Influenza; the Mycobacterial Diseases, including Leprosy, Tuberculosis, and Sarcoidosis; and Miscellaneous Bacillary Infections, including Anthrax, Glanders, Melioidosis, Lymphangitis, Epizootica, Swine Erysipelas and Erysipeloid, Rat-bite Fever, Necrobacillosis and Fusospirochetosis, Oroya Fever and Proteus Infections.

While this reviewer is in accord with the author's view that "the mere accumulation of facts . . . cannot be regarded as an ideal form of education", and that it would be far more satisfying to "find the time to study medicine as it has slowly evolved", it is hard to understand just what criteria were used in evaluating the relative importance of certain diseases. For example, diphtheria and typhoid fever are each discussed for more than 50 pages, while regional ileitis and chronic ulcerative colitis together are given only a trifle more than four pages. The first two diseases are fast becoming medical curiosities, while the latter two are of increasing interest and importance.

Doubtless later editions of the book will be better balanced as to content. The minor criticism offered is not intended to detract from the value of the volume as a well-written, scholarly and authoritative work. Further volumes along the principles of this one will be awaited with interest.

Conservation of Iron.—The iron conserving mechanism of the body is remarkable in that none of this iron reserve is lost in any appreciable degree through excretion. When hemoglobin disintegrates to form bilirubin and the other bile pigments, the iron bearing hematin is split off early in the process to be conserved within the body and apparently reutilized in the formation of new hemoglobin. What, then, are the sources of loss of iron from the body, and through what channels may this reserve be depleted? We may say specifically that this may occur only through the processes of bleeding, of pregnancy and lactation, and of growth.—Philip F. Eckman, M.D.: Indications for Use of Iron in Treatment of the Anemias, Minnesota Medicine, 23:713 (October) 1940.

In Memoriam

John Thomas Johnson Battle, M.D.
1859-1940

By William M. Jones, M.D.

Dr. Battle died after a short illness in the early morning of September 30 of coronary occlusion.

He was born in Wake County and spent his early years in and around Wake Forest College, from which he received his M.A. degree. He then entered the College of Physicians and Surgeons, now combined with the University of Maryland, where he received his M.D. degree in 1884. He practiced a while at Wadesboro. In 1896 he married Miss Dora Burns of Wadesboro, and in 1898 he moved to Greensboro, where he soon acquired the confidence of the community and of his confreres.

During the World War he was Chairman of the District Advisory Board for military service. He was a member of the Guilford County Board of Health from its organization in 1911.

He was for years a Trustee of both Wake Forest and Meredith Colleges, and was very active on the Board of the latter at the time of his death.

He was one of the pioneers of life insurance in Greensboro, and was Medical Director of the Jefferson Standard Life Insurance Company, having served in that capacity since 1918.

He was always a constant attendant at the meetings of his County and State Medical Societies, and for years has been an Honorary Fellow of both Societies. He served on the Board of the Medical Examiners of the state from 1902 to 1908.

He was a perfect example of a Christian gentleman, and like St. Luke, was a beloved physician.

"Abou Ben Adhem (may his tribe increase!)
Awoke one night from a deep dream of peace,
And saw, within the moonlight in his room,
Making it rich, and like a lily in bloom,
An angel writing in a book of gold:—
Exceeding peace had made Ben Adhem bold,
And to the presence in the room he said,
What writest thou? The vision rais'd its head,
And with a look made of all sweet accord,
Answer'd, The names of those who love the Lord.
And is mine one? said Abou. Nay, not so,
Replied the angel. Abou spoke more low,
But cheerly still; and said, I pray thee, then,
Write me as one that loves his fellow-men.
The angel wrote, and vanish'd. The next night
It came again with a great wakening light,
And show'd the names whom love of God had blessed,
And lo! Ben Adhem's name led all the rest."

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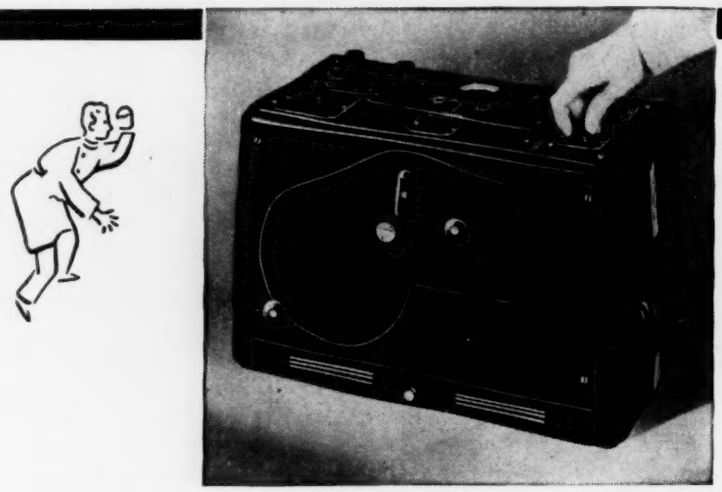

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